



Update from the Publications and Speakers Committee

Edda Gschwendtner (CERN), Patric Muggli (MPP)
Guoxing Xia (Uni. Manchester), David Cooke (UCL)

AWAKE Collaboration Meeting
15-17th October 2025, CERN

<https://indico.cern.ch/event/1593074>

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, Spokesperson
 - Guoxing Xia (Uni. Manchester)
 - David Cooke (UCL)
- Email: awake-pc@cern.ch
- Rules: 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”, if collaboration-wide papers, organize reviews
 - Maintain Official Author List (OAL)
 - Keep a list of public papers: <https://twiki.cern.ch/twiki/bin/view/AWAKE/AwakePublic>
- **Please send talks/proceeding papers/posters at least 1 week before conference!**

AWAKE collaboration-wide papers

Emittance measurement of accelerated e- beam submitted to PRAB

Measurement of the emittance of accelerated electron bunches at the AWAKE experiment

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M. Bergamaschi,³ S. Mazzoni,² L. Ranc,³ E. Senes,² P. Sherwood,¹ M. Turner,² and M. Wing¹

(AWAKE Collaboration)

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A. Clairembaud,² C. Davut,^{6,7} G. Demeter,¹¹ A.C. Dexter,^{7,8} S. Doebert,² A. Fasoli,⁵
R. Fonseca,^{12,13} I. Furno,⁵ N.Z. van Gils,^{2,14} E. Granados,² M. Granetzny,¹⁵ T. Graubner,¹⁶
O. Grulke,^{9,17} E. Gschwendtner,² E. Guran,² J. Henderson,^{7,18} M.Á. Kedves,¹¹ F. Kraus,¹⁶
M. Krupa,² T. Lefevre,² L. Liang,^{6,7} S. Liu,¹⁹ N. Lopes,¹³ K. Lotov,^{20,21} M. Martinez Calderon,²
J. Mezger,³ P.I. Morales Guzmán,³ M. Moreira,¹³ T. Nechaeva,³ N. Okhotnikov,^{20,21}
C. Pakuza,⁴ A. Pardons,² K. Pepitone,²² E. Poimendidou,² J. Pucek,³ A. Pukhov,²³
R.L. Ramjiawan,^{2,4} S. Rey,² R. Rossel,² H. Saberi,^{6,7} O. Schmitz,¹⁵ F. Silva,²⁴ L. Silva,¹³
B. Spear,⁴ C. Stollberg,⁵ A. Sublet,² C. Swain,^{7,25} A. Topaloudis,² N. Torrado,^{2,13} P. Tuev,^{20,21}
M. Turner,² F. Velotti,² V. Verzilov,¹⁹ J. Vieira,¹³ E. Walter,²⁶ C. Welsch,^{7,25} M. Wendt,²
J. Wolfenden,^{7,25} B. Woolley,² G. Xia,^{7,6} L. Verra,^{2,†} V. Yarygova,^{20,21} and M. Zepp¹⁵

Status:

Working through
reviewers' comments and
updating the manuscript.

Multiple author papers

Energy gain measurement with variable plasma lengths Journal of Physics: Conference Series (2025)

A method for measuring energy gain with variable plasma length at AWAKE

F. Pannell¹, D. A. Cooke¹, N. Z. van Gils², E. Gschwendtner², M. Turner², M. Bergamaschi^{2,3}, L. Ranc³, P. Muggli³ and M. Wing¹

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Abstract. The AWAKE experiment investigates the acceleration of externally injected electrons into the wakefields driven by a self-modulated proton bunch. In Run 1, AWAKE successfully demonstrated proton bunch self-modulation and accelerated electrons from 19 MeV to 2 GeV. For Run 2b, upgrades to the rubidium vapour source enabled the introduction of a plasma density step and adjustments to the plasma length. This facilitated studies on how the density step sustains the longitudinal wakefield amplitude by measuring the electron energy gain as a function of the plasma length. This paper presents the analysis techniques for such energy measurements and the technical considerations for interpreting results under the varying plasma conditions.

Electron beam scattering in Rubidium vapour Journal of Physics: Conference Series (2025)

Electron beam scattering in Rubidium vapour at AWAKE

N. Z. van Gils^{1,2}, M. Moreira², M. Turner², E. Gschwendtner², L. Ranc³, J. Mezger³, M. Bergamaschi^{2,3}, P. Muggli³, D. Cooke⁴, F. Pannell⁴ and A. Gerbershagen¹

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Abstract. The Advanced Wakefield Experiment (AWAKE) at CERN uses bunches from the CERN SPS to develop proton-driven plasma wakefield acceleration. AWAKE Run 2c (starting in 2029) plans for external on-axis injection of a 150 MeV electron witness bunch with the goal to demonstrate emittance control of multi-GeV accelerated electron beams. Prior to injection, the electron witness bunch may have to traverse rubidium vapour. Since the beam must have the correct beam size and emittance at injection, it is important to quantify the scattering effect. For this, first-principle estimates and GEANT4 simulations are compared with measurements of a ~20 MeV electron beam scattering in 5.5 m of rubidium vapour, showing good agreement. Building on this agreement, GEANT4 simulations using the estimated AWAKE Run 2c parameters are performed. These predict that scattering will not increase the electron beam size or emittance.

Multi-author papers

Self-modulation as a function of plasma length NIMA (2025)

Nuclear Instruments and Methods in Physics Research A 1073 (2025) 170265



Development of self-modulation as a function of plasma length

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ARTICLE INFO

Keywords:
Plasma
Wakefields
Instability
Numerical simulations
Saturation
AWAKE
Proton
Self-modulation

ABSTRACT

We use numerical simulations to determine whether the saturation length of the self-modulation (SM) instability of a long proton bunch in plasma could be determined by measuring the radius of the bunch halo SM produces. Results show that defocused protons acquire their maximum transverse momentum and exit the wakefields at a distance approximately equal to the saturation length of the wakefields. This suggests that measuring the radius of the halo as a function of plasma length in the AWAKE experiment would yield a very good estimate for the saturation length of SM.

Plasma light as a diagnostic for wakefields NIMA (2025)

Nuclear Instruments and Methods in Physics Research A 1075 (2025) 170426



Implementation of light diagnostics for wakefields at AWAKE

J. Mezger ^{a,b,c,*}, M. Bergamaschi ^{a,c}, L. Ranc ^a, A. Sublet ^c, J. Pucek ^{a,b,c}, M. Turner ^c,
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ARTICLE INFO

Keywords:
Plasma
Beam-driven plasma wakefield accelerator
AWAKE
Plasma light
Diagnostic
Laser
Field ionization

ABSTRACT

We describe the implementation of light diagnostics for studying the self-modulation instability of a long relativistic proton bunch in a 10 m-long plasma. The wakefields driven by the proton bunch dissipate their energy in the surrounding plasma. The amount of light emitted as atomic line radiation is related to the amount of energy dissipated in the plasma. We describe the setup and calibration of the light diagnostics, configured for a discharge plasma source and a vapor plasma source. For both sources, we analyze measurements of the light from the plasma only (no proton bunch). We show that with the vapor plasma source, the light signal is proportional to the energy deposited in the vapor/plasma by the ionizing laser pulse. We use this dependency to obtain the parameters of an imposed plasma density step. This dependency also forms the basis for ongoing studies, focused on investigating the wakefield evolution along the plasma.

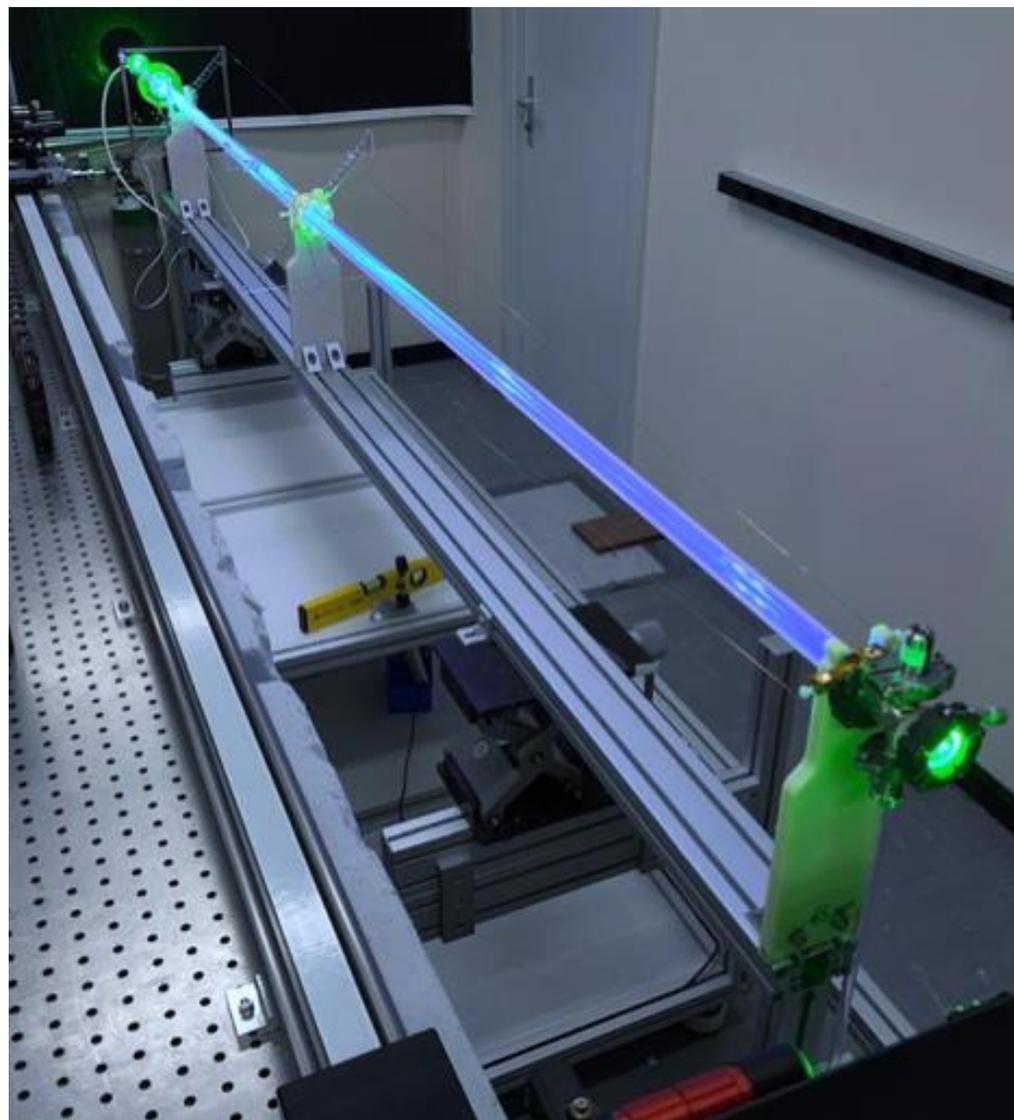


EAAC25

Good presence
from AWAKE
Collaboration!

**Plenty of AWAKE
talks/posters at
the EAAC2025!**

Poster prize to Carolina!



Local plasma density measurements of a Discharge Plasma Source for AWAKE using Thomson Scattering

Carolina Amoedo^{1,2},
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Presentations/Talks

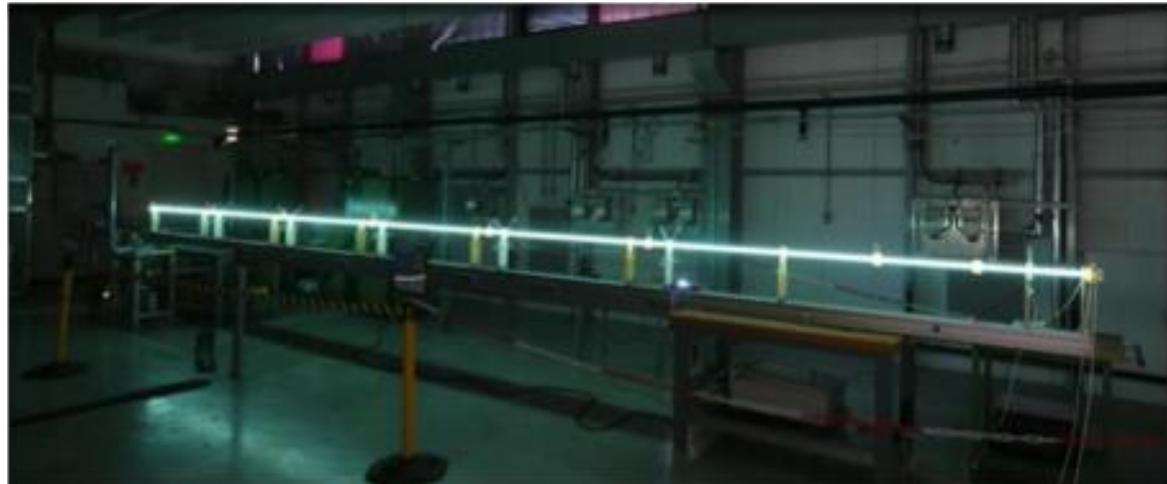
- Fern Pannell, *First measurements of electron acceleration with plasma density steps at AWAKE*, talk at IPAC25
- Christine Stollberg: Updates from AWAKE's Helicon Plasma Source: Plasma Diagnostics Driving Particle Acceleration, talk at 52nd IEEE International Conference on Plasma Science (ICOPS), 15-20 June 2025 in Berlin.
- Marlene Turner: *High gradient wakefield accelerators (i.e. laser- and beam driven)*, talk at ESPP25, June, Venice.
- Marlene Turner: *Ion motion and self-modulation suppression in a plasma wakefield accelerator*, Plenary talk at the EPS Conference on Plasma Physics 2025, 7-11th July, 2025 in Lithuania.
- Marlene Turner: *AWAKE: proton driven plasma wakefield acceleration for particle physics applications*, invited talk at AAC25.
- Carolina Amoedo: *A discharge plasma source for proton driven plasma acceleration at AWAKE*, talk at the EPS Conference on Plasma Physics 2025, 7-11th July, 2025 in Lithuania.
- Patric Muggli: *AWAKE: High-energy electrons for particle physics from a plasma wakefield accelerator*, talk (or poster) at EPS Conference on Plasma Physics 2025, 7-11th July, 2025 in Lithuania.
- John Farmer: AWAKE: from proof-of-concept towards first particle-physics applications, AAPPs-DPP, 21-26th September, Japan, 2025
- Eleonora Belli: *Design and Challenges of the witness electron beam injection for AWAKE Run 2c*, talk at EAAC25, 21-27th September 2025.
- Edda Gschwendtner: *The Program of AWAKE towards High-Energy Electrons for Particle Physics Experiments*, talk at EAAC25, 21-27th September 2025.
- Michele Bergamaschi: *AWAKE Run 2b density step plasma source*, talk at EAAC25, 21-27th September 2025.
- Michele Bergamaschi: *Experimental study of the growth of hosing instability: preliminary results*, talk at EAAC25, 21-27th September 2025.
- Alban Sublet, *Overview of scalable plasma source R&D for the AWAKE project at CERN*, talk at EAAC25, 21-27th September 2025.

Posters/Proceedings

- Jan Aaron Mezger: *Light Emission of Dissipating Wakefields*, EAAC25 poster.
- Jan Aaron Mezger: *Correlating Light Emission and Wakefield Dissipation*, EAAC25 poster.
- Carolina Amoedo: *Beam Energy Deposition in Plasma Electrons during Wakefield Acceleration by Long Drivers*, EAAC25 poster.
- Carolina Amoedo: *Local plasma density measurements of a Discharge Plasma Source for AWAKE using Thomson Scattering*, EAAC25 poster.
- Arthur Clairembaud: *Experimental measurement of the saturation length of self-modulation*, EAAC25 poster.
- Nikita Zena van Gils: *Seeding Proton Bunch Self-Modulation in AWAKE with a Long Electron Bunch*, EAAC25 poster.
- Lucas Alexei Ranc: *Measurement of the radius of a plasma column in presence of a relativistic proton bunch*, EAAC25 poster.
- Mariana Moreira: *Finding tolerances for the future diagnostics of AWAKE Run 2c*, EAAC25 poster.

PhD success !

Dr. Torrado !
(August 2025)



**Pulse generator for a scalable discharge plasma
source for the AWAKE experiment**

Nuno Espanha Torrado da Silva

Thank you!