

Introduction



Collaboration Meeting

Patric Muggli *AWAKE collaboration*

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MAX-PLANCK-INSTITUT
FÜR PHYSIK

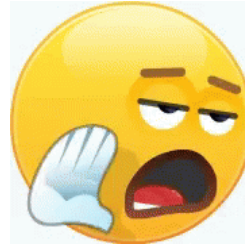


Thank you to Kevin et al.

Ευχαριστώ τον Κέβιν κτλ.

Welcome to the collaboration meeting

✧ New Spokesperson: Patric Muggli



New people @ CERN:

- ✧ Marlene Turner (CERN staff, 1st January)
- ✧ Nikita van Gils (PhD, 1st April)
- ✧ Arthur Clairembaud (Master student, 1st April)
- ✧ Bethany Spear (PhD, October 22, 1 year)
- ✧ Jan Mezger (Master, April 1)
- ✧ Fern Pannel (PhD, April 1, 1 year)
- ✧ ...

Important to be at CERN to effectively contribute to the experiment!

3/127

NOT NEWS

✧ Run 1: 2018-2021

- ✧ Self-modulation

- ✧ Acceleration of test e-

✧ Run 2a => 2022

- ✧ e-bunch seeding of SM

✧ Run 2b => 2024

- ✧ Plasma density step

- ✧ Discharge plasma source

✧ Run 2c 2028 =>

- ✧ Injection of witness e-bunch into second, accelerator plasma

✧ Run 2d

- ✧ Operation with scalable accelerator plasma

- ✧ Discharge, helicon source

✧ March 2023

- ✧ Run 2c preparation retreat @ CERN

- ✧ What?

- ✧ Who?

- ✧ Outcome: Q4-2023



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- ✧ Discharge, helicon source

✧ Application to particle physics 2030's

✧ March 2023: Run 2c preparation retreat @ CERN

- ✧ What? Who? How much?
- ✧ Outcome: Q4-2023



Opportunity to:

- ❖ Meet new people ...
- ❖ Make personal contacts ...
- ❖ Be informed about plans ...
- ❖ Generate new ideas ...

Participate

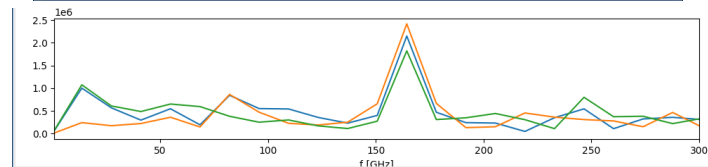
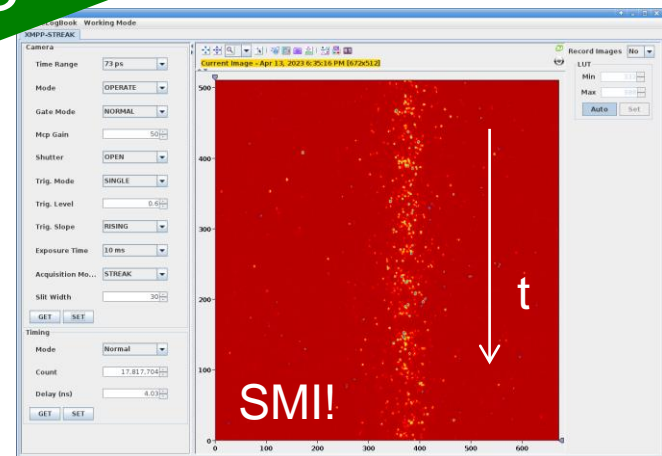
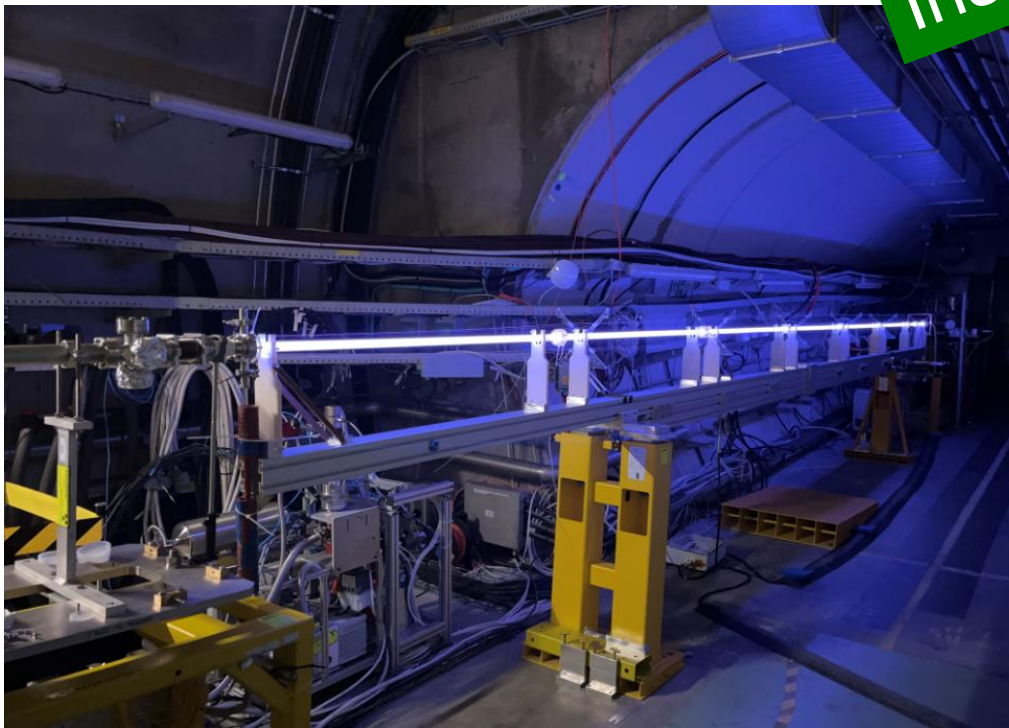


Research topics, 10m discharge plasma source (DPS), **May 2023**:

- ✧ Plasma source: Ar, Xe, He
- ✧ Self-modulation instability (SMI)
- ✧ Current filamentation instability (CFI)
- ✧ Ion motion on SMI, Xe-Ar-He
- ✧ Hose instability at low plasma density, flat beams?
- ✧ Plasma light: diagnostic for wakefields

Installed and running!

3h test 13/04/2023



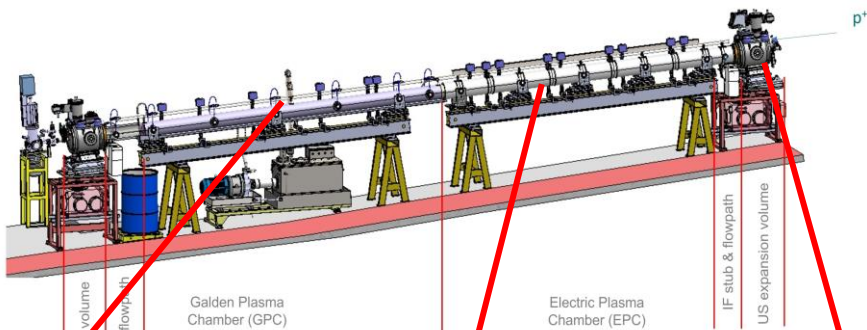
$f_{\text{mod}} \sim 164 \text{ GHz} \sim f_{\text{pe}} (n_{e0} \sim 3.4 \times 10^{14} \text{ cm}^{-3})$ ✓
Time-resolved image shows SMI with DPS

VAPOR SOURCE: DENSITY STEP

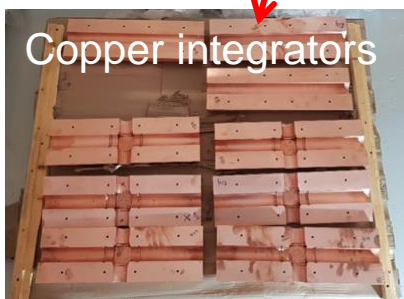
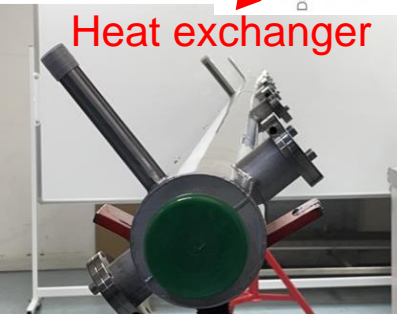
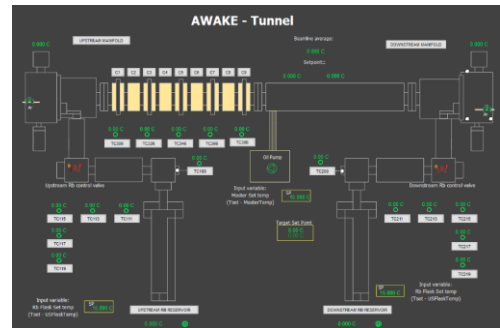
Research topics, vapor source, **August 2023-2024:**

- ❖ Effect of plasma density step on:
 - ❖ Proton bunch, time resolved and integrated images
 - ❖ Plasma light, wakefield diagnostic
 - ❖ e- acceleration
 - ❖ Seeding of self-modulation, RIF and e-bunch
 - ❖ Short plasma (4m?) for self-modulation

On schedule!



WDL



In preparation (Collaboration manuscripts, Run 2a):

- ✧ Livio: SMI or not (today)
- ✧ Tatiana: hosing
- ✧ Jan: e- in density ramp
- ✧ Jan: SM RIF seeding
- ✧ ...



✧ Experiments

PHYSICAL REVIEW LETTERS **129**, 024802 (2022)

Editors' Suggestion

Featured in Physics

Controlled Growth of the Self-Modulation of a Relativistic Proton Bunch in Plasma

L. Verra^{1,2,3,*}, G. Zevi Della Porta,¹ J. Pucek,² T. Nechaeva,² S. Wylser,⁴ M. Bergamaschi,² E. Senes,¹
E. Guran,¹ J. T. Moody,² M. Á. Kedves,⁵ E. Gschwendtner,¹ and P. Muggli²

(AWAKE Collaboration)

✧ Simulations

PHYSICAL REVIEW LETTERS **130**, 115001 (2023)


Mitigation of the Onset of Hosing in the Linear Regime through Plasma Frequency Detuning

Mariana Moreira^{1,*}, Patric Muggli,^{2,3} and Jorge Vieira^{1,†}

¹GoLP/Instituto de Plasmas e Fusão Nuclear, Instituto Superior Técnico, Universidade de Lisboa, 1049-001 Lisboa, Portugal

²Max Planck Institute for Physics, D-80805 Munich, Germany

³CERN, CH-1211 Geneva, Switzerland

 (Received 1 August 2022; accepted 27 January 2023; published 17 March 2023)

WELCOME TO UPPSALA

Participate



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