

# PAEPA

## EuroNNAC and EuPRAXIA Workshop on Pilot Applications of Electron Plasma Accelerators

*Oct 11-13, 2016  
Ecole Polytechnique  
Amphi Gregory*

Supported by EU Horizon 2020

European Network for Novel Accelerators

The EuroNNAC 2 logo, featuring the text "EuroNNAC 2" in a stylized font with a blue and yellow gradient background.

supported by EU via EuCARD2

# Lunches and Dinners

## ❑ Dinner tuesday 10/11 19h30 (today)

- Restaurant “Le Gramophone” , 27 Bd Dubreuil 91 400 Orsay
- RER B (direction St-Remy-Les Chevreuse): stop Orsay-Ville
- 10 min walk from Hotel d’Orsay
- drive luggage to hotel? (AS)

## ❑ Lunches wednesday 10/12 and thursday 10/13:

- Club Magnan canteen space (tickets will be distributed)

## ❑ Amphi Gregory will be locked during lunch time

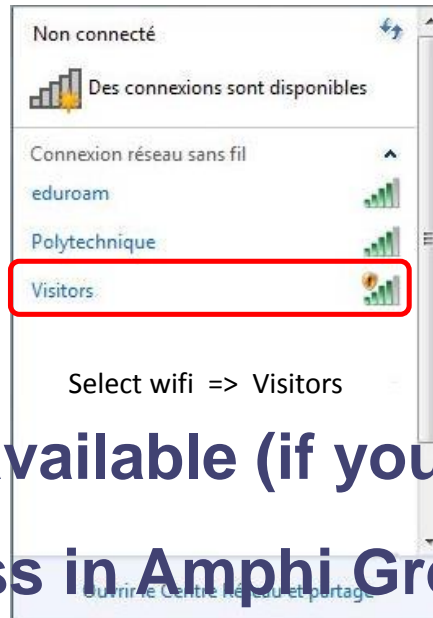
## ❑ Dinner Wednesday 10/12 19h30

- Bastide Odéon, 7 rue Corneille 75006 Paris
- RER B (direction CDG, Mitry): stop "Luxembourg »
- we’ll meet at the restaurant?

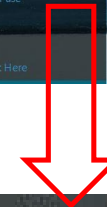
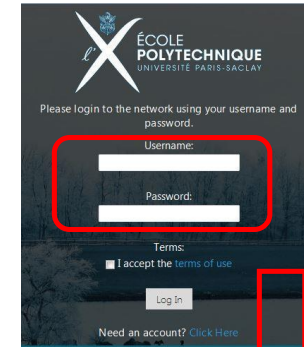
# On-site Accomodation

- Maison d'hôtes (guest house) of Ecole polytechnique**
- keys**
  - **guest house office hours: 8h30-12h00 13h30-16h30**
  - **security office (fire brigade building 20)**
- before departure, please restore keys to**
  - **guest house office hours: 8h30-12h00 13h30-16h30**
  - **or leave it in the box**
- breakfast not included**
  - **possibility to have breakfast at the canteen**
  - **tickets (2.75€ cash only) can be purchased at canteen cash desk from 11:30 a.m. to 2:00 p.m**

# Internet Connection



Open your browser



Username:

Password:

❑ eduroam available (if you have it)

❑ WiFi access in Amphi Gregory

- network: Visitors
- in your browser use
  - login: wifi-eupraxia
  - password: r0PKfKt50W

# Sponsors

**This workshop is fully supported by the EU EuroNNAC2 network, through the EuCARD2 program**

**EuCARD2 : European Coordinated Accelerator R&D  
FP7 (2013-2017)**

**EuroNNAC: European Network for Novel Accelerators**

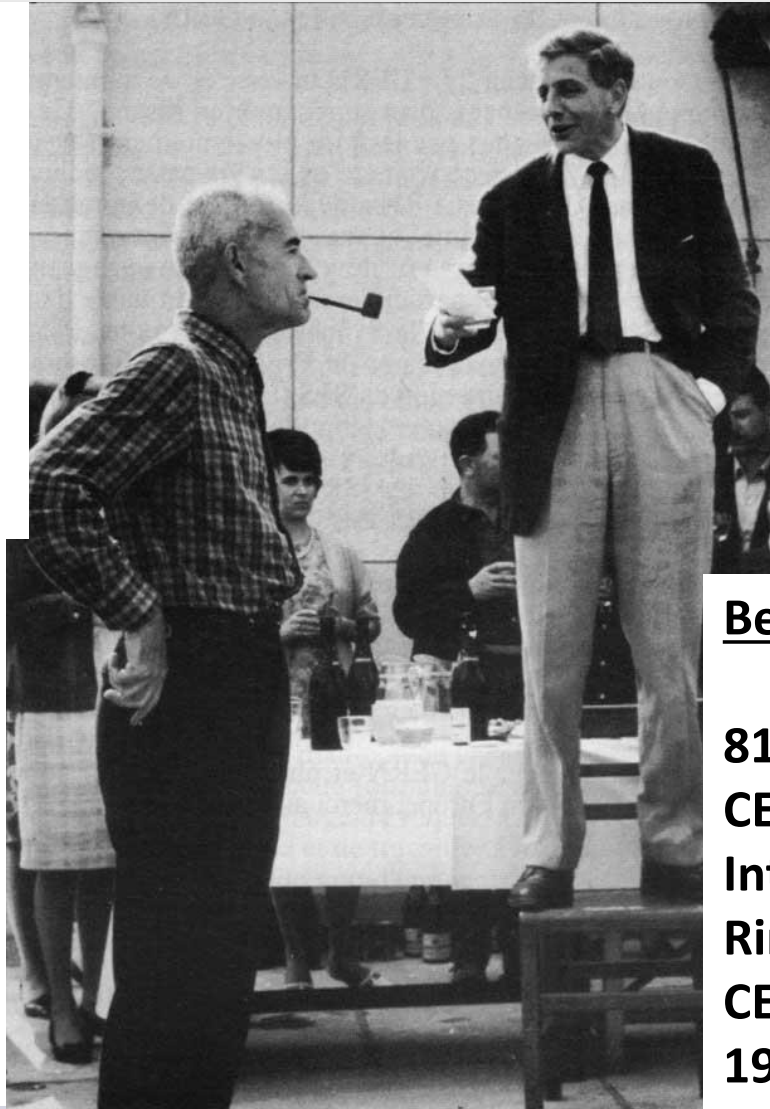


# Names and Places

## Louis LEPRINCE-RINGUET

founder of first research  
lab at Ecole polytechnique

first observation of  
strange mesons  
in cosmic rays (1943)



## Bernard GREGORY

81cm bubble chamber on  
CERN PS (1959)  
Intersecting Storage  
Rings ISR (1965)  
CERN Director General  
1965–1970

# Goals of the workshop

- identify realistic near-future applications for**
  - laser-plasma accelerated electron beam
  - laser-plasma generated EM radiation (Terahertz to gamma)
- identify needs for realizable applications for the future EuPRAXIA laser-plasma accelerator test-facility**
  - beam characteristics (either electrons or photons)
  - environment (space, equipment, additional beams)
- organize follow-up with potential users**
  - integrate application requirements in evolving design study

# H2020 Design study EuPRAXIA

- ❑ **EuPRAXIA = European Plasma Research Accelerator with Excellence in Applications**
- ❑ **H2020 call** design studies of future research infrastructures
- ❑ **11/2015–10/2019, 16 partners, 16 associated partners**
- ❑ **main outcome: conceptual design report (2019)**  
**Including site-studies and financial planning**
- ❑ **EuPRAXIA parameters** => *Andy Walker (next talk)*
- ❑ **EuPRAXIA design study and strategy**  
=> *Ralph Assmann (tomorrow morning)*



# Scope of EuPRAXIA

- only electrons (proton/ion acceleration not considered)
- plasma accelerator research facility

AND

- user facility for applications
  - => effort on “industrial” beam quality, 24/7 availability,...
- Applications
  - FEL driver -> smaller XFEL
  - high energy and other applications of electrons and photons

# Applications

- Applications of plasma generated X-rays and gammas
- Medical, biological, space applications
- Applications of electron beams for high energy ph. (HEP)
  - test beams for HEP detector development
  - fundamental physics experiment
  - test facility for bunch length diagnostics
- Applications of electron beams other than HEP
  - positron sources
  - generating a “e-/e+ plasma” beam
- R&D of plasma accelerators as an application
  - 2 stage acceleration, hybrid acceleration, plasma devices....

## «Questionnaire»

- ❑ Your input is ~~valuable~~ necessary!
- ❑ Please use the questionnaire as a guideline to orient the EuPRAXIA design study to suit your needs!
- ❑ Please do not feel constrained by the form of the questionnaire.
- ❑ The «HEP and other» applications may be the most immediately reachable for a future facility.

EuroNNAC and EuPRAXIA Workshop on  
**Pilot Applications of Electron Plasma Accelerators (PAEPA)**  
 Oct. 11-13, 2016, Ecole Polytechnique (Palaiseau, France)

### Required electron beam parameters (example)

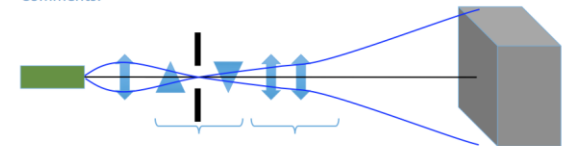
This is an example, the numbers bear no relation to what indeed may be required for each application.

Description of application				
Simultaneous calibration of large electro-magnetic detector modules with electrons. A wide, quasi-parallel beam sprays a granular calorimeter module.				
parameter	required value/range		desirable in future	
	min	max	min	max
energy [GeV]	0.5	3	0.1	10
energy spread (after selection) [%]	0.5%	1%	0.1%	0.3%
energy fluctuation (shot-to-shot) [%]	1%	2%	0.1%	
number of delivered electrons	10	100	10	100
precision on n delivered electrons [%]	10%	50%	1%	10%
bunch duration [fs]	does not matter, if <10ps			
repetition rate [Hz]	10	1000	100	1000
number of del'd bunches per hour	1000	4000	1000	10000
beam diameter [m]	0.3	0.		
beam divergence [mrad]	1	3	0.1	1
electron flux density per shot [m <sup>-2</sup> ]	<b>not more than 0.1 electrons in a Mollere radius!</b>			

### Other requirements (infrastructure, equipment, space, etc)

parameter	required value/range	
	min	max
size of setup zone (length, width, height)	1m x 0.5m x 0.5m	4m x 1m x1m
size of user zone (length, width, height)	5m x 5m x 3m	10m x 5m x 5m
magnet (type, field strength, volume)	no	solenoid, 1T, 1m <sup>3</sup>
additional laser (energy, duration)	no	no
synchronisation signal (duration, jitter)	1ms, jitter 100ps	1ms, jitter 100ps
fiducial references	yes	yes
background monitoring	yes	yes
radiation protection (sv/hour)	to be evaluated	
moveable stage (range )	0.5m	1m
cryogenics	no	no
cooling	no	yes

Comments:



# PAEPA workshop sessions

Tue, 10/11		Wed, 10/12		Thu, 10/13	
				09:00	Coffee welcome
		09:00	Introduction 2	09:30	Diagnostics, configurations, infrastructure
		11:00	HEP applications	11:05	Conclusion
12:30	Lunch break	12:30	Lunch break	12:30	Lunch break
13:30	Introduction 1	13:30	HEP applications	13:45	CILEX Visit
14:30	Imaging	14:25	Positrons	<p><b>group photo on Wednesday 10h30 (before coffee break)</b></p>	
16:00	X-rays & gammas				
17:20	Medicine, Biology, Space				
19:30	Workshop dinner	19:30	Workshop dinner		