# THE EuPRAXIA FACILITY

# Preliminary study concept

The EuPRAXIA study is considering at the moment several combinations between acceleration schemes in order to reach its baseline parameters. In total there are nine different scenarios, of which the most promising ones will be selected in 2019:

### Case 1 – LWFA with internal injection A. Acceleration to 1 GeV and staging to 5 GeV B. Acceleration to 5 GeV directly

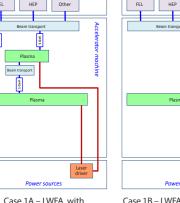
Case 2 - LWFA with external injection from RF accelerator A. Acceleration to 1 GeV and staging to 5 GeV B. Acceleration to 5 GeV directly

Case 3 – LWFA with external injection from laser plasma injector A. Acceleration to 1 GeV and staging to 5 GeV B. Acceleration to 5 GeV directly

Case 4 – PWFA A. Acceleration to 1 GeV B. Acceleration to 5 GeV

### Case 5 – Hvbrid scheme

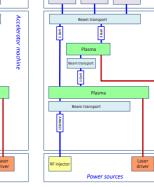
Laser Wakefield Acceleration and staging to a Plasma Wakefield Accelerator with acceleration to 3 GeV. The figures below provide a schematic diagram of each of the nine scenarios considered in the study.

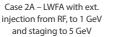


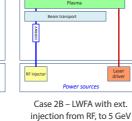
internal injection, to 1 GeV

and staging to 5 GeV

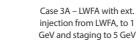
Case 1B – I WFA with internal injection, to 5 GeV directly







directly



# **Facility structure**

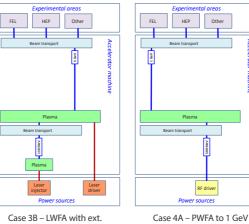
1) Power sources (RF electron linacs and high-power laser systems)

- 2) Accelerator machine:
  - Plasma structures,
  - Transport lines,
- Instrumentation for monitoring and control.
- 3) Experimental areas
  - Free-electron lasers (FEL),
  - High-energy physics (HEP) and other pilot applications.

### The total footprint of the facility is 250 m

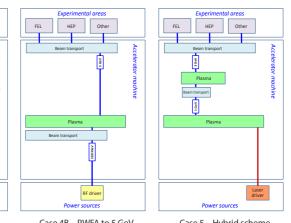
## **Output parameters**

The baseline parameters for the electron beam output are defined by the main applications of EuPRAXIA: free-electron lasers, high-energy physics detector applications, and other pilot applications.



injection from LWFA, to 5

GeV directly







Energy Pulse le Repetiti Laser in

Laser dr Waveler

Waveler Energy Pulse le Repetiti

# Electro

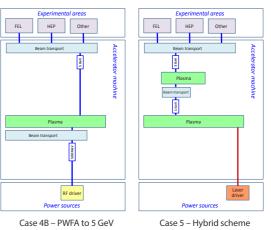
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Electro

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iver (Cases 1, 2, 3 & 5		
ngth	800 nm	
	100 J	
ength (FWHM)	100 fs	
ion rate	10-100 Hz	

jector (Case 3):	
ngth	800 nm 5 J
ength (FWHM) ion rate	30 fs 10-100 Hz

n beam injector (Cases 2 & 3):				
	From RF	From LWFA		
,	160 MeV	150 MeV		
2	50 pC	100 pC		
length	38 fs	5 fs		
urrent per bunch	3 kA	20 kA		

#### Electron beam driver (Case 5):

	1 GeV	
:	100 pC	
length	10 fs	
urrent per bunch	10 kA	

n beam output:		
	Cases 1 – 4	Case 5
	5 GeV	3 GeV
	100 pC	30 pC
length	5 fs	3 fs
ırrent per bunch	20 kA	10 kA
nergy spread (RMS)	5%	5%
erse normalized emittance	1 mm mrad	1 mm mrad
erse beam size (RMS)	0.32 μm	0.41 μm
erse divergence (RMS)	0.32 mrad	0.41 mrad
eam to global reference (RMS)	10 fs	10 fs

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