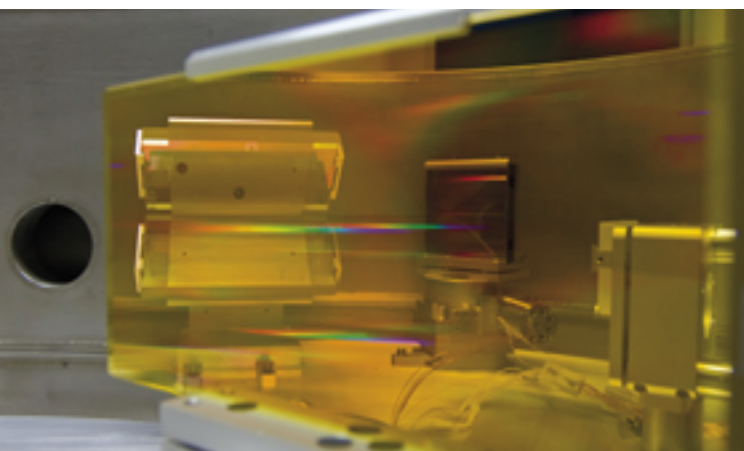


## Applications

The outstanding feature of the CLPU will be the availability of Petawatt pulses. However, for several applications maybe this huge power is not necessary. The goal of the CLPU is to bring to the user a ladder of pulses ranging from a fraction of Terawatt to the Petawatt. The enormous list of potential applications of all these beams is therefore impossible to elaborate. As a general description of the most exciting areas to work in we present the following list (from less to more required power):

- Interaction with biomaterials
- Micro and nanoprocessing of materials
- Filamentation
- Strong-field femtochemistry
- High-order harmonic generation
- X ray laser pulses
- Relativistic filamentation
- Production of relativistic beams of electrons
- Plasma physics
- Nuclear physics
- Ion acceleration to multi MeV.
- Radiopharmacy applications.
- Protontherapy.
- Vacuum polarization



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## Spanish Center of Ultrashort Ultraintense Lasers

The CLPU is a national facility specializing in femto-second laser pulses with peak powers at Gigawatt, Terawatt and Petawatt levels.

### What is CLPU?

The Center of Ultrashort Ultraintense Lasers (CLPU) is a new research facility that has been created as a Consortium formed by the Ministry of Science and Innovation, the Castilla y León government and the University of Salamanca, as a part of implementation of the roadmap of the spanish scientific infrastructures. The Consortium is based in Salamanca, Spain and it was established on December 2007.

The objectives of the Consortium are:

- To construct and operate a Petawatt laser in Salamanca.
- To develop ultrashort pulses technology in Spain.
- To make significant advances in compact and intense laser technology.
- To promote the use of this technology in various fields: physics, engineering, biology, medicine, etc...
- To open the facility to the national and international scientific community.

### Where is it?

The CLPU operates temporarily with a 20 TW laser at the Physics Building at the University of Salamanca. It is currently planned for CLPU a new building in the Parque Tecnológico de Villamayor. There are about 4 km from the future building and current location. Road access is really easy to Villamayor through the ring of Salamanca.

### Main beam lines

The foremost beam line at CLPU will be a pulsed source with peak power 1 Petawatt. The Petawatt system will consist of a laser chain of CPA amplifiers based on Ti:Sapphire crystals, leading to pulse duration of around 20 fs. Obtaining a repetition rate as high as 1 Hz is our goal.

In addition to the Petawatt, other main beams with less peak power but similar pulse duration will be

also available at CLPU: 1 Terawatt, 20 Terawatt and 200 Terawatt.

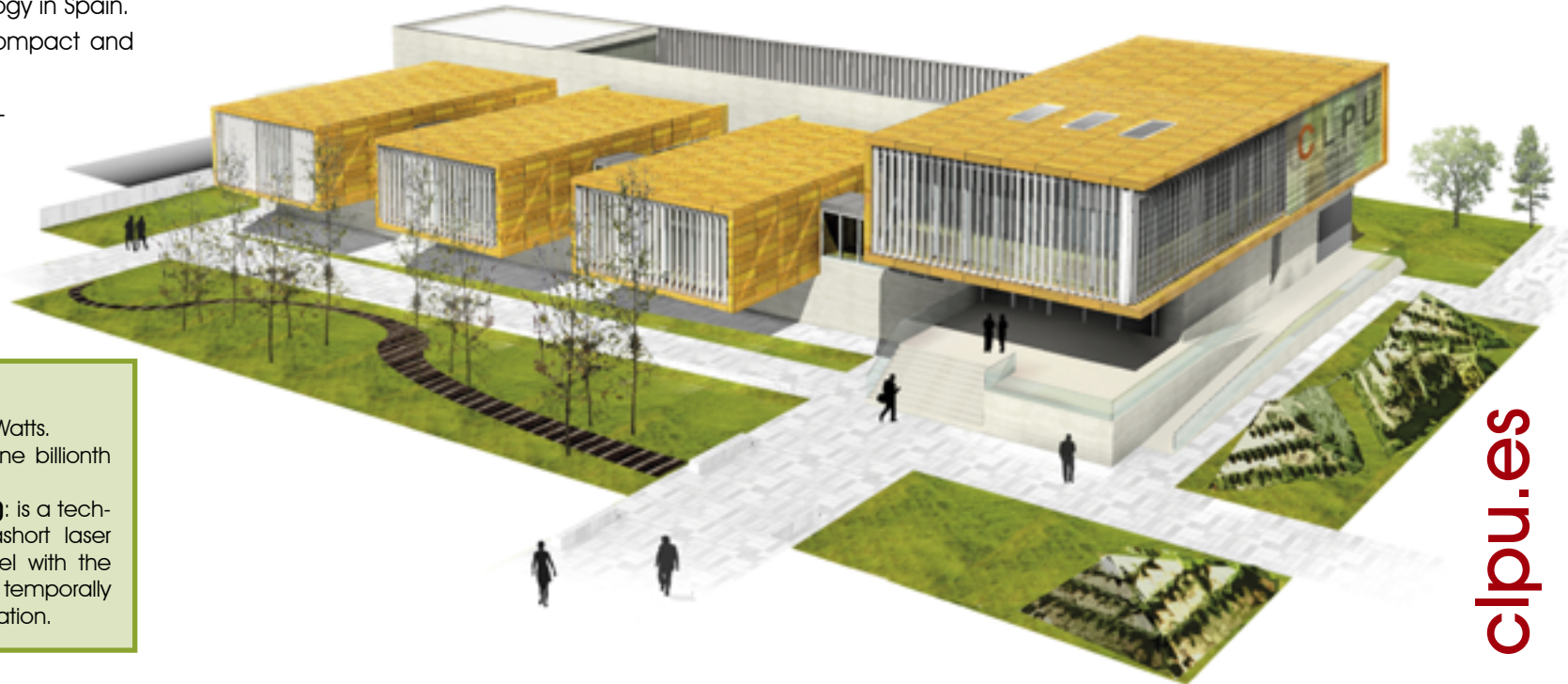
### Auxiliary beam lines

The main beam lines will be complemented with the following secondary sources:

- Kilohertz repetition rate femtosecond source
- CEP-stabilized femtosecond source

Other sources obtained from the main beam lines are expected to be available:

- Soft X ray pulsed laser source.
- Attosecond pulse source.
- Few-femtosecond multi-millijoule source.
- IR-Vis-UV tunable femtosecond source.
- Relativistic electron beam source up to GeV.
- Proton beam source, up to 100 MeV.



## What is it?

**Terawatt:** a trillion of Watts.

**Petawatt:** one thousand trillion of Watts.

**Femtosecond:** one millionth of one billionth of a second.

**CPA (Chirped Pulse Amplification):** is a technique for amplifying an ultrashort laser pulse up to the petawatt level with the laser pulse being stretched out temporally and spectrally prior to amplification.