



## **ERASMUS Intensive Program**

### **USIL Bordeaux University**

#### **WEEK 1 Ultra-short Lasers**

##### **Monday, November 30**

9:00-10:00 Welcome and presentations 1h

10:00 – 11:30: Short Presentation from each attendees:

Origin and expectations 1h 30

##### ***“Laser & Optics in the Ultrashort regime”***

13:30 – 14:30 Basics of pulse propagation (linear and non linear optics) 1h

14:30 – 16:00 Laser Theory: From CW to Mode locking 1h30

16:15- 18:15 Optical simulations ( MIRO) 2h

##### **Tuesday, December 1**

##### ***“Femtosecond Laser Oscillators”***

9:00 – 10:30 Mode locking Techniques 1h30

10:45 – 12:15 Laser materials and pumping sources 1h30

13:30 – 15:00 Femtosecond Fiber Lasers 1h30

15:15– 18:15 3h00

- Laser Computer simulations Temporal behaviour
- Lab: Femtosecond Oscillators

### **Wednesday, December 2**

#### ***“Amplification of Ultrashort laser pulses”***

9:00 – 10:30	Amplification in solid state materials	1h30
10:45 – 12:30	Amplification strategies	2h
13:30 – 15:00	Limitations and bottlenecks	1h30
15:00 – 15:45	Computer simulations : Multipass and regen	45'
16:00 – 18:00	LAB: Regenerative amplifier ; illustration of limits	2h

### **Thursday, December 3**

#### ***“Non linear Optics and tunable ultrashort lasers”***

9:00 – 10:30	Non linear Optics and propagation effects	1h30
10:45 – 12:15	Parametric sources	1h30
13:30 – 14:30	Ultra intense and ultrashort sources: Non linear strategies	1h
14:30 – 15h30	Computer simulations:	1h
	<ul style="list-style-type: none"> <li>• SNLO: Cristal optimisation</li> <li>• Propagation in fibers</li> </ul>	
15:45 – 18:00	LAB: Frequency conversion and continuum generation	2h

### **Friday, December 4**

#### ***“Visit of Aquitaine Laser platform and demonstrations”***

## Week 2: Metrology and applications

### Monday, December 7

*“Time & space representation of a laser field & Metrology of lasers ».*

*Energy, space, time and frequency.*

#### Part I: Basics and Advanced techniques”

8:30 – 12.00 Basic metrology of Ultrashort oscillators

- Energy, temporal and spectral properties 1h30
- Spatial properties and propagation. 1h30'

#### Part 2 : “Advanced Techniques”

13:30 – 15 :30 Advanced measurement techniques :

- Time-Frequency domain. 1h
- Spatial domain 1h

16:00 – 18:00 Lab Work Ia/Ib

Energy/autoco/spectrum/ Spider/Spatial phase 2h

## **Tuesday, December 8**

### ***Extreme field (THz, Ultrawide, Attosecond, Intense, XUV)”***

8:00 – 9:00	Emission and Detection of Terahertz radiation, THz Spectroscopy	1h
9:00 – 10:00	Intense laser metrology and issues.	1h
	<ul style="list-style-type: none"> <li>• Pointing instability,</li> <li>• Non linear and thermal Focusing</li> <li>• Hot spot, Spatial filtering</li> <li>• High temporal contrast measurement, ASE</li> </ul>	
10:15 – 12:15	Lab work IIa/IIb  (amplified system characterisation and control)	2h
13:45 – 15:15:	Metrology of Ultrawide sources  octave spanning, white light and Attosecond pulses (f-2f, CEP)	1h30'
15:30 – 17:00	Metrology of XUV Sources	1h30'

## **Wednesday, December 9**

### ***“Metrology of lasers and Pulse shaping.***

#### **Temporal Shaping**

8:00 – 9:00	Temporal Shaping I  SLM-based techniques	1h
9:00 – 10:00	Temporal Shaping II  AOPDF	1h
10:15 – 12:15	Lab Work Ib/Ia Pulse shaping and metrology	2h

### Spatial Shaping

13:30 – 15:00	Spatial Shaping	1h30'
15:00 – 18 :00	Experiments and simulations	3h00
	<ul style="list-style-type: none"> <li>• Computer Simulations of measurement techniques</li> <li>• Lab work IIb/IIa</li> </ul>	

***18 :00-21:00 Meeting with Industry and Research Centers***

### **Thursday, December 10**

#### ***“Intense Laser fields and Plasmas”***

8:00 – 10:00	Isochoric heating induced by laser particle acceleration	2h
10:15 – 12:15	Studies of Warm Dense Matter using high intensity laser	2h
13:30 – 15:30	X-ray diagnostics for laser plasma studies	2h
15:45 - 18:00	Computer Simulations	2h

Studies of X-ray emission from laser created plasmas

### **Friday, December 11**

9h00-16h30	“Experimental work on COLA’s Laser platform in Bordeaux ”
16h30- 17h30	Evaluation