

1st Meeting MSCA-ITN-2014-ETN MEDEA

**“Molecular Electron Dynamics investigated by Intense
Fields and Attosecond Pulses”**

Presentation of participant FORTH



D. Charalambidis

F.O.R.T.H. - I.E.S.L./ Univ. of Crete
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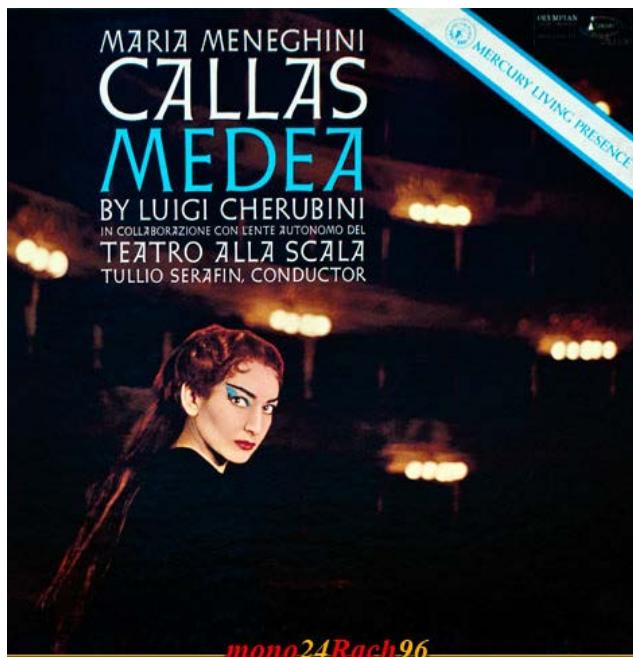
**19th-20th January 2015
Max Born Institute
Berlin, Germany**



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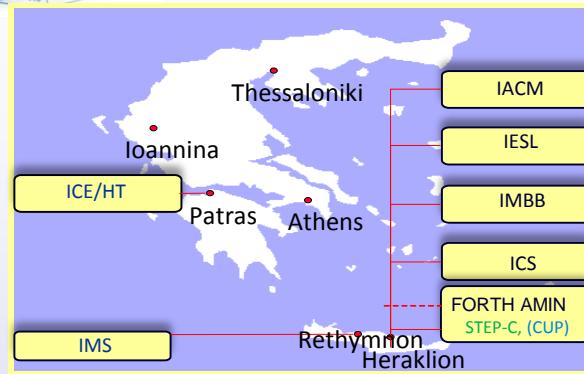
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Foundation for Research & Technology - Hellas

(Since 1983)



Personnel: ~ 1100 employs





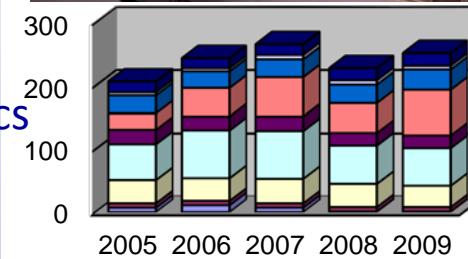
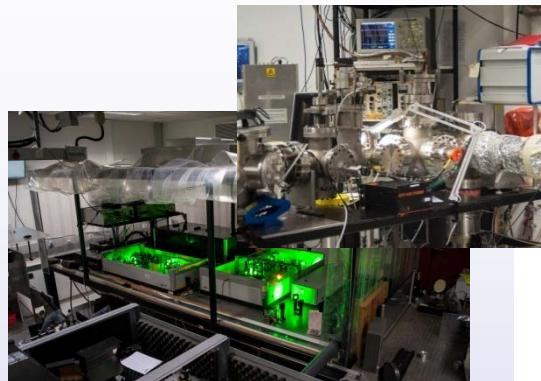
Foundation for Research & Technology - Hellas

Institute of Electronic Structure and Laser (IESL)

2 MAJOR DIVISIONS

LASER INTERACTIONS & PHOTONICS DIVISION

- Strong Field Physics-attosecond S&T
- Atoms, Molecules and Clusters
- Theoretical Atomic, Molecular & Optical Physics
- Photon Science Applications



MATERIALS & DEVICES DIVISION

- Micro/Nano-electronics
- Soft Matter
- Magnetic Materials
- Theoretical Condensed Matter Physics
- Metamaterials

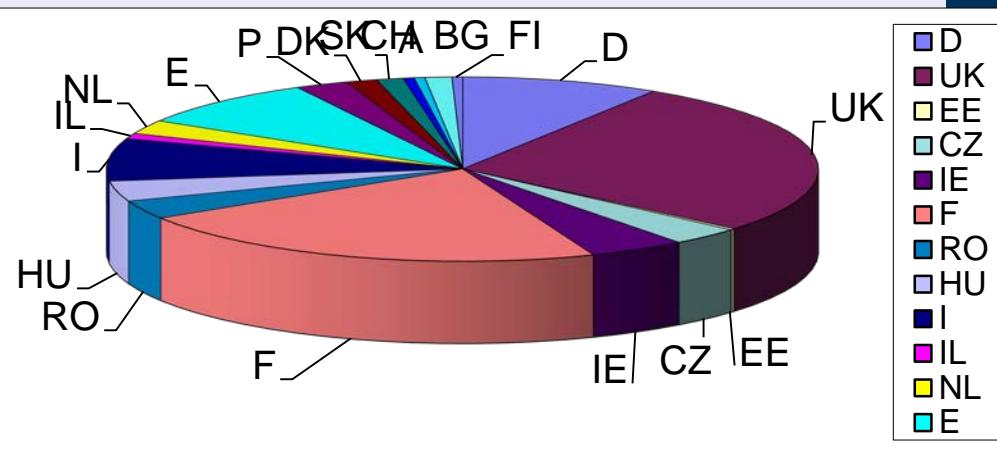




Foundation for Research & Technology - Hellas

IESL-FORTH: A European Laser Research Infrastructure Member of Laserlab – Europe & more

Access provided during 1990-2010



255 projects,

<http://www.laserlab-europe.net/>

414 researchers from European Research Centers,

2845 days of access

The Attosecond Science & Technology (AST) Team

(Since 1994)

Team members in the last 5 years

P. Tzallas (researcher)

B. Bodi (PhD)

P. A. Carpeggiani (PhD)

D. Gray (laser technician)

C. Kalpouzos (researcher)

G. Kolliopoulos (PhD)

E. Kosma (Post doc)

J. Kruse (PhD)

E. Skatzakis (Post doc)

S. Chatziathanasiou

I. Gonoskov (Post doc)

G. Antonaropoulos (PhD)

N. Papadakis (technician)

I. Tsatrafilis (PhD)

A. Kargazis (technician)

& D. Charalambidis



Collaborations

G. D. Tsakiris

H. Schröder

L. Veisz

B. Bergues



L. A.A.
Nikolopoulos



F. Martin
A. Palacios



D. Robotis
M. Dresher



O. Faucher



A. Zair
J. Marangos



P. Dombi

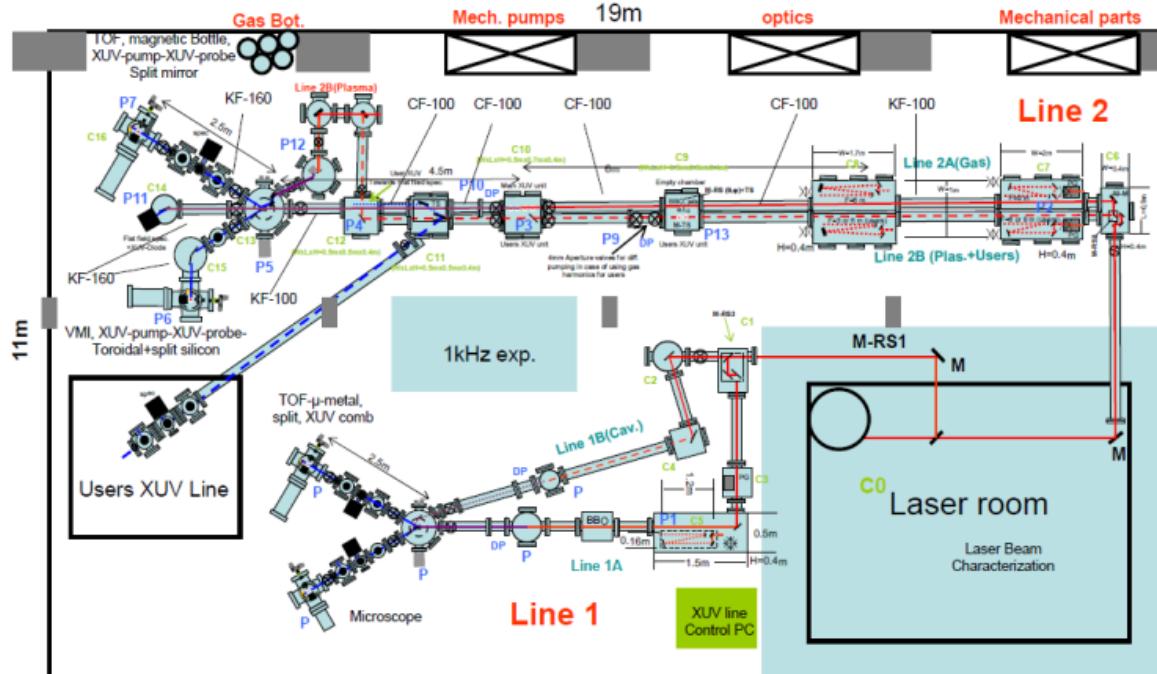


G. Sansone

About the AST lab: Our goals & means

Goals: Generation, characterization & use of
energetic XUV/x-ray continua& asec pulses

Means: High peak power driving laser, long focal lengths, IPG, SHHG



New Lab, laser & atto lines

- Driving Laser: 800nm, 18fs, 400mJ, 10Hz
- Focal lengths for gas targets: 3 or 6 or 9 m
- Tight focusing for surface plasma HHG
- Diagnostics: TOF, PES, VMI, Ion microscope, XUV/x ray spectrometers, XUV/x-ray delay lines



About the AST lab: Research Highlights

➤ Development of tools and sources for energetic XUV/attosecond pulses

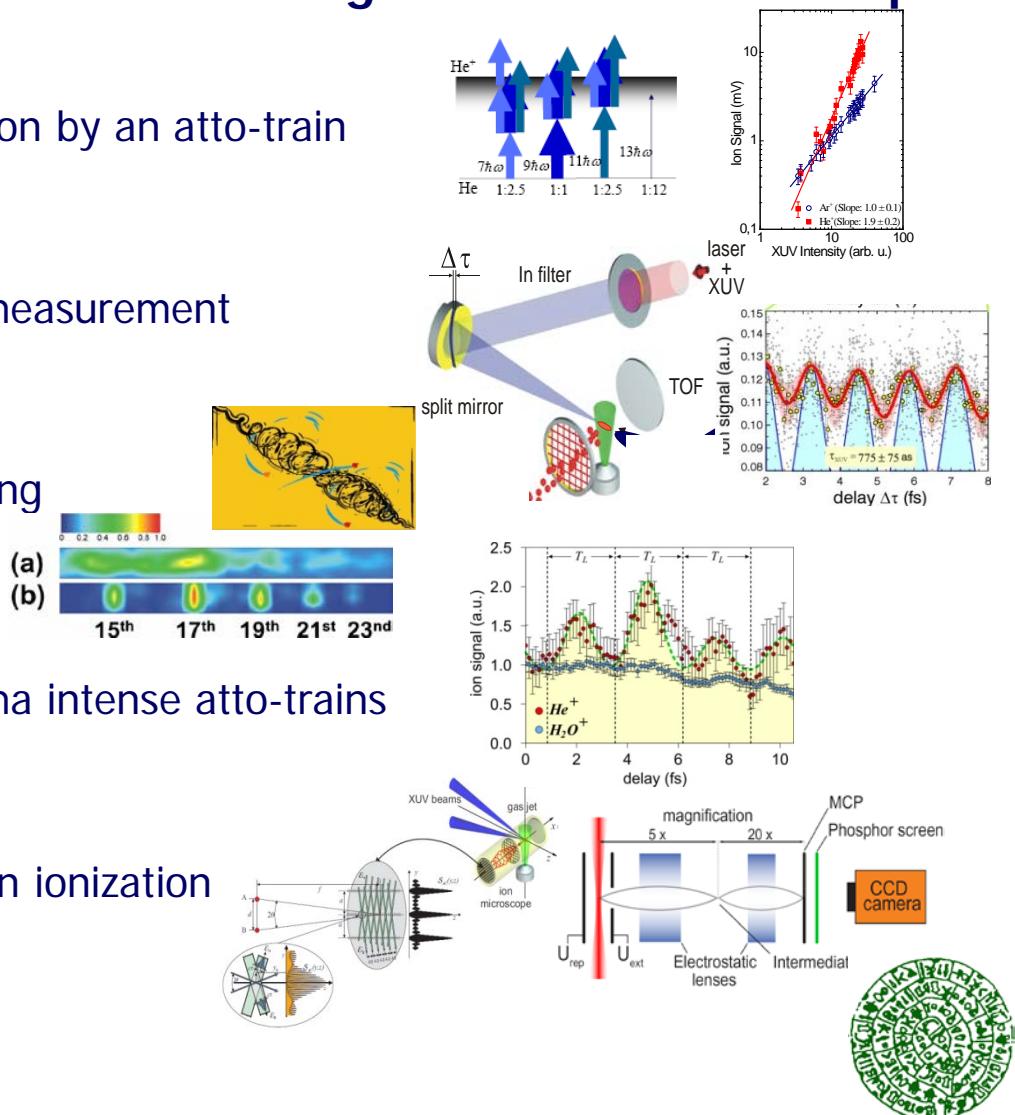
2001: Two-XUV-photon atomic ionization by an atto-train
Phys. Rev. Lett. **87**, 109402 (2001)

2003: 2nd order IVAC / the atto-train measurement
Nature **426**, 267 (2003)

2007: Interferometric polarization gating
Nature Physics **3**, 846 (2007)

2009: 2nd order IVAC of surface plasma intense atto-trains
Nature Physics **5**, 124 (2009)

2014: Spatially resolved 2-XUV-photon ionization
towards single shot 2nd order XUV AC
J. Opt. Soc. Am. B **31** (2014)



About the AST lab: Research Highlights

➤ Applications of energetic XUV/attosecond pulses

2009: Two VUV photon

time resolved spectroscopy

Phys. Rev. A**79**, 061405 (R) (2009)

2012: Two XUV photon ATI by

surface plasma harmonics

Phys. Rev. A**79**, 061405 (R) (2009)

2011: XUV-pump-XUV-probe studies of

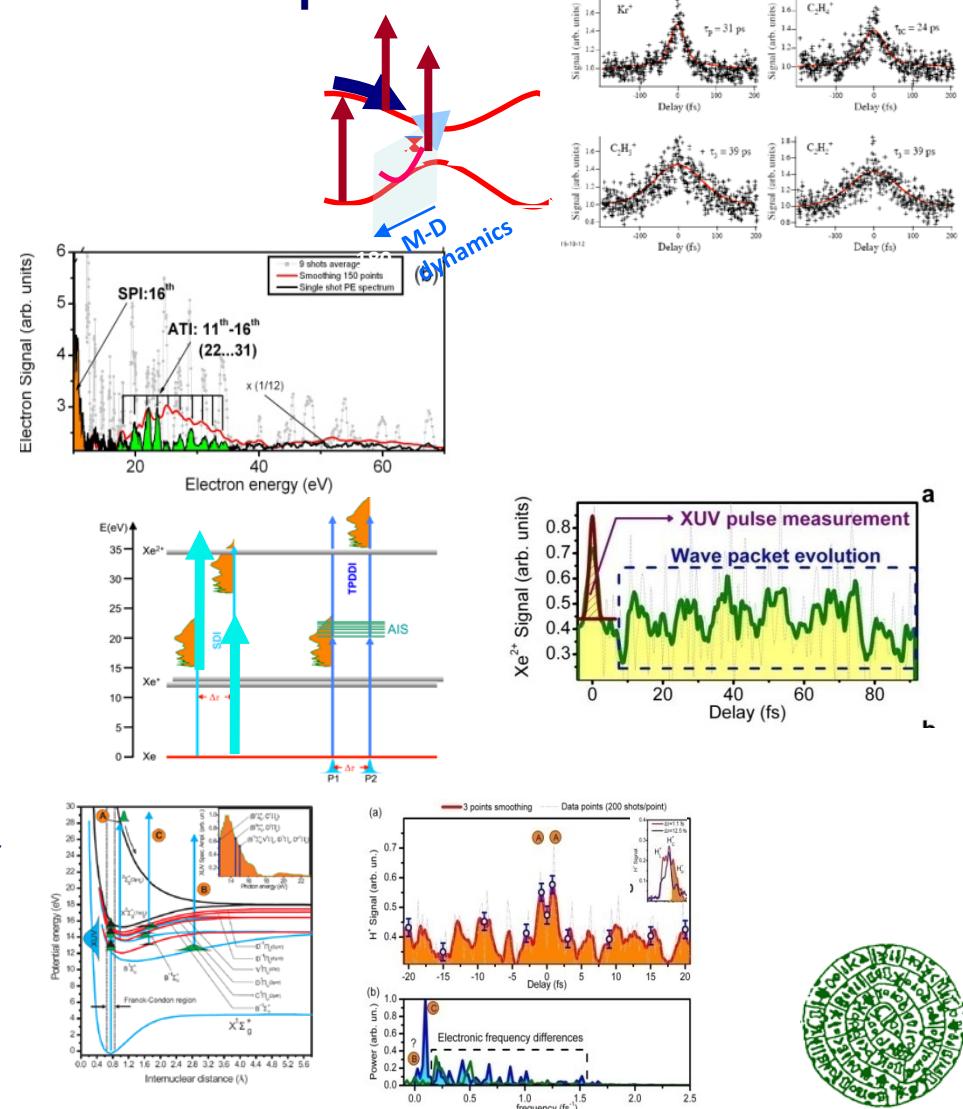
1fs scale dynamics in atoms / DTPDI

Nature Physics **7**, 781 (2011)

2013: XUV-pump-XUV-probe studies of

1fs scale molecular dynamics

Phys. Rev. A**89**, 023420 (2014)



About the AST lab

➤ Funded EU & national research projects

~ 30 projects , ~ 10 Meuros (since 1994)
(among them: 6 Marie Curie + 3 IHP + 6 HCP)

➤ Training

>40 MSc , PhD students & postdoctoral fellows in total from 12 countries



➤ Training Outcome

7 non Hellenic Univ. faculty members

2 Hellenic Univ. faculty members

1 Research inst. staff members

3 non permanent Univ./Research inst. members

7 non academic positions in Greece & abroad



About the AST lab: Future plans including MEDEA tasks

Development of means

- Operate CEP tagging
- Extend spectral range of energetic XUV/x-ray pulses
- Increase spectral and temporal resolution
- Demonstrate single shot non-linear XUV/x-ray AC

Projects

- 2nd order IVAC of isolated attosecond pulses (through tagging)
- Implementation of single shot 2nd order AC
- XUV-pump-XUV-probe studies of molecular dynamics
 - *Vibronic wavepacket and ionization dynamics in H₂ - role of AIS (@ increased frequency-time resolution)*
 - *isomerization dynamics in C₂H₂ @ higher temporal resolution*
- Two-photon inner shell spectroscopy

