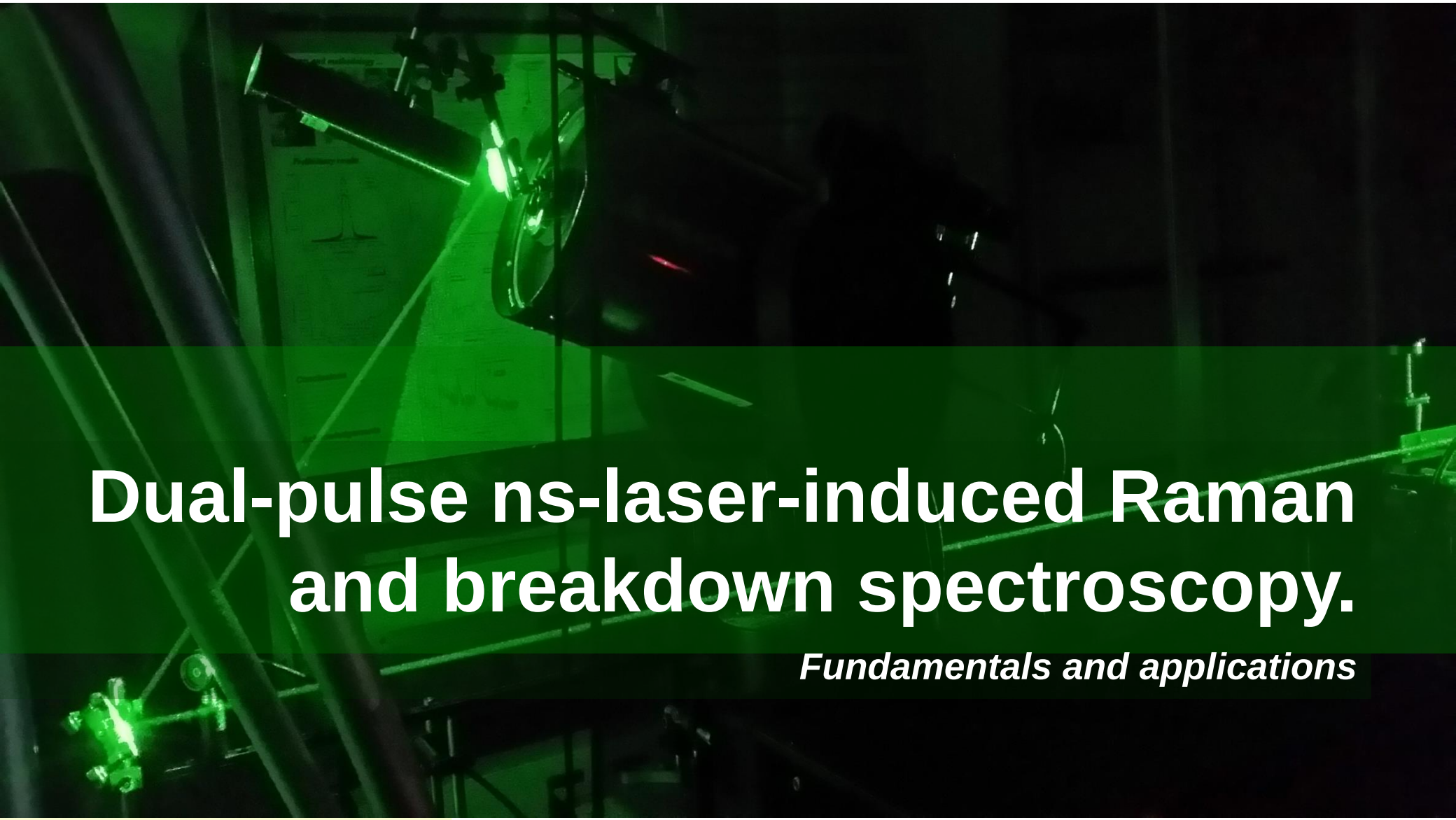

Dual-pulse ns-laser-induced Raman and breakdown spectroscopy.

Fundamentals and applications

"Alexandru Ioan Cuza" University of Iasi, Faculty of Physics,
Atmosphere Optics, Spectroscopy and Lasers Laboratory, Romania

S. Gurlui

Atmosphere Optics, Spectroscopy and Lasers Laboratory LOA-SL

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Since 2007, **LOASL** has undertaken and consolidated research partnerships, both in the country and abroad, among which we mention: **France** (Lille 1 University, Paris XI / LPGP, Orsay, University of Angers) from **Austria** (University of Innsbruck), from **Germany** (FAIR - Facility for Antiproton and Ion Research) and from **Romania** (Gh Asachi Technical University of Iasi, University of Craiova, University of Bucharest, INOE Bucharest, INFLPR Magurele, etc.

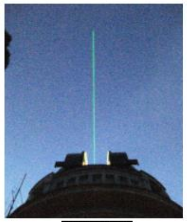
LOASL won through national and international competitions **30 projects** with a total value of **over 3 million euros**. LOASL's research infrastructure, focused of the Earth's atmosphere, is one of the best in the country. Research directions are mainly focused on cutting-edge technology applied in space science, clime or laser physics, both fundamental and applied research.

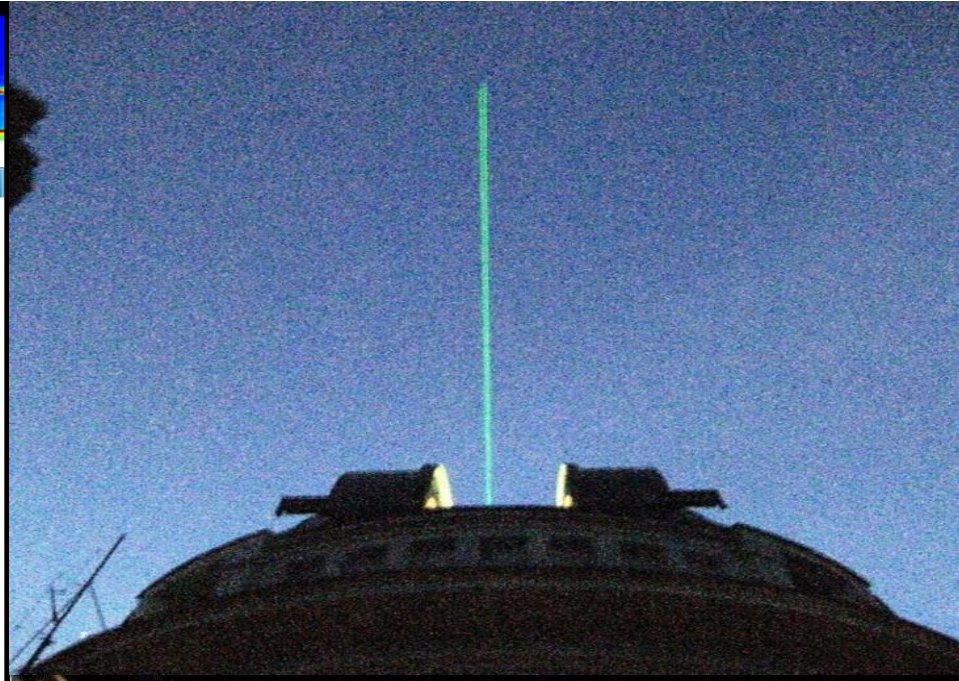
Atmosphere Optics, Spectroscopy and Lasers Laboratory performs complex studies in the following researcher fields:

- Optics and Lasers
- Plasma Physics
- Laser ablation spectroscopy. Pulsed laser deposition (PLD)
- Polymer sciences (applications in the materials science, optoelectronics, environmental sensors)
- Fundaments and atmospheric environment, interaction of laser with atmospheric aerosols
- Environmental monitoring techniques (active and passive optical instruments), LIDAR Techniques)
- Self-organization. Nonlinear dynamics

Image result for actris ro

Search



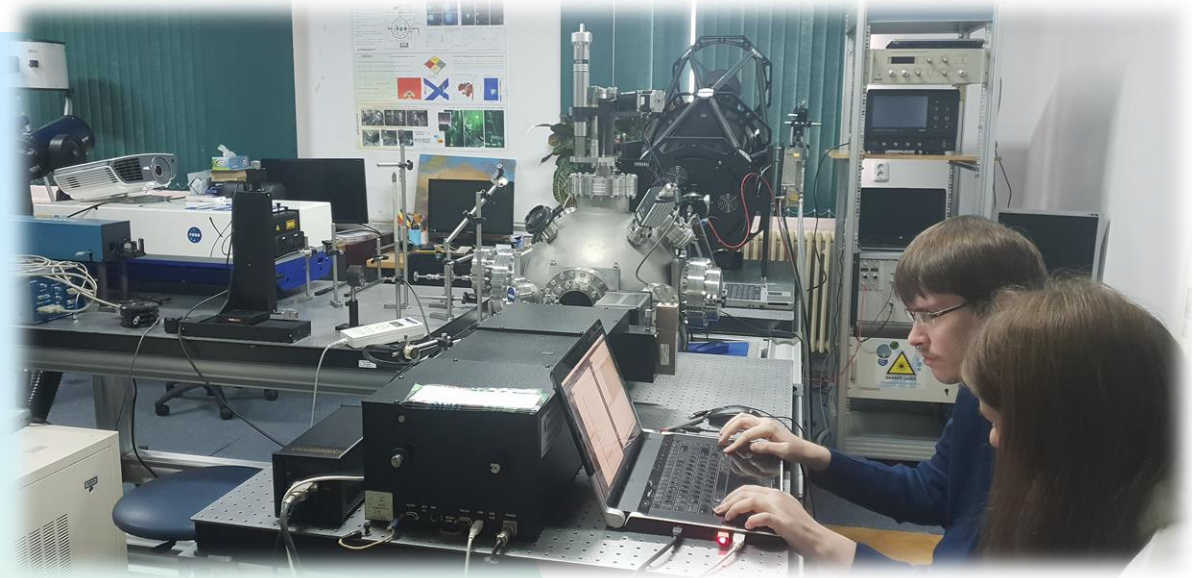


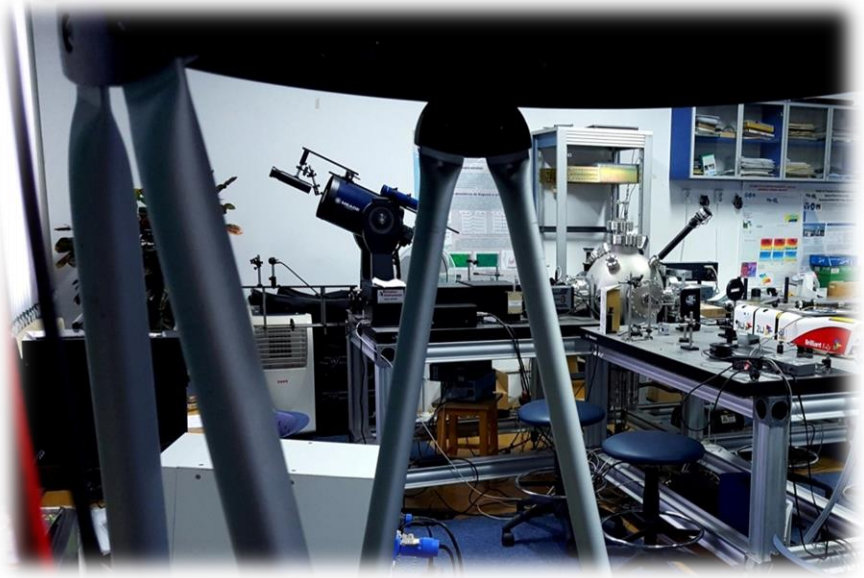
RESEARCH

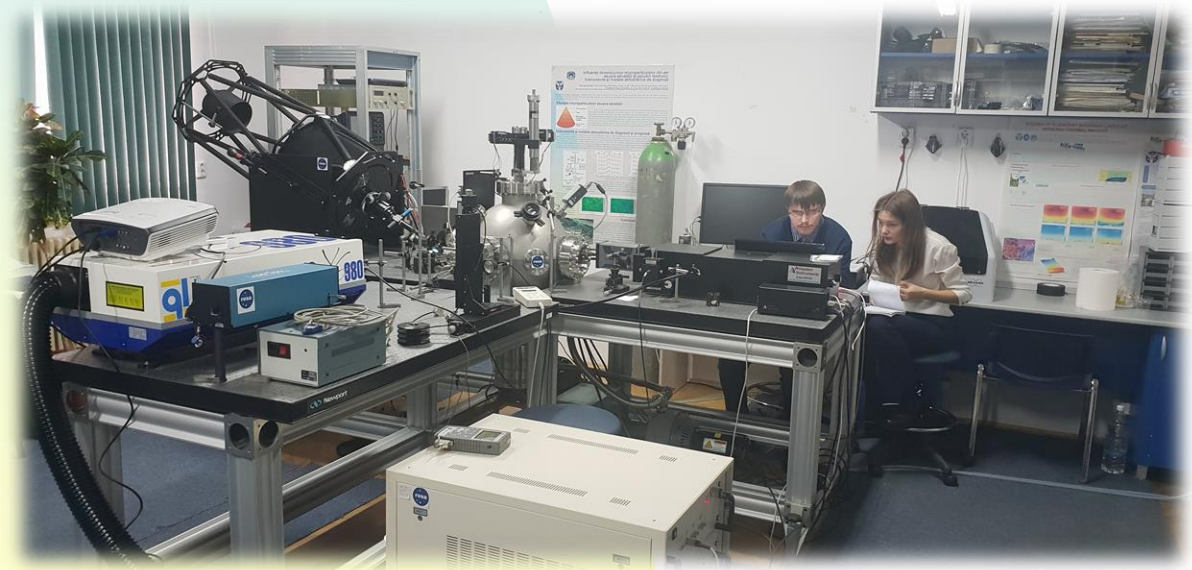
Laser Spectroscopy
Plasma Spectroscopy
Atmosphere optics

Atmosphere Optics, Spectrsocopy and Lasers Laboratory (LOA-SL)

http://spectroscopy.phys.uaic.ro

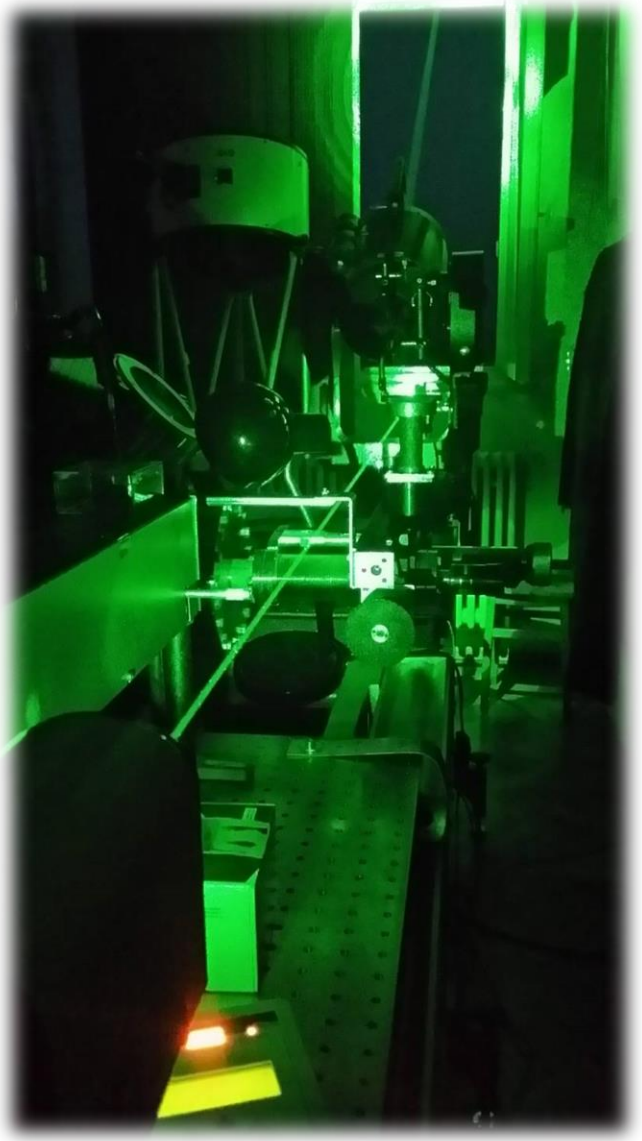


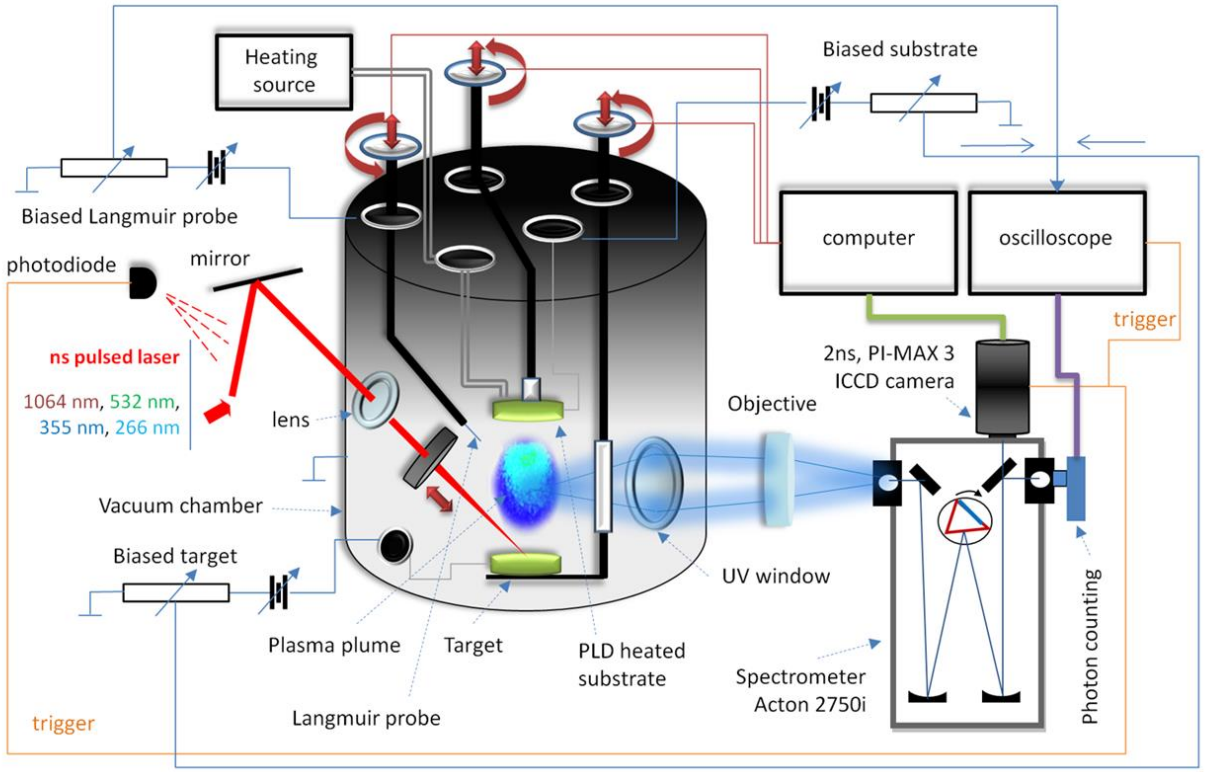


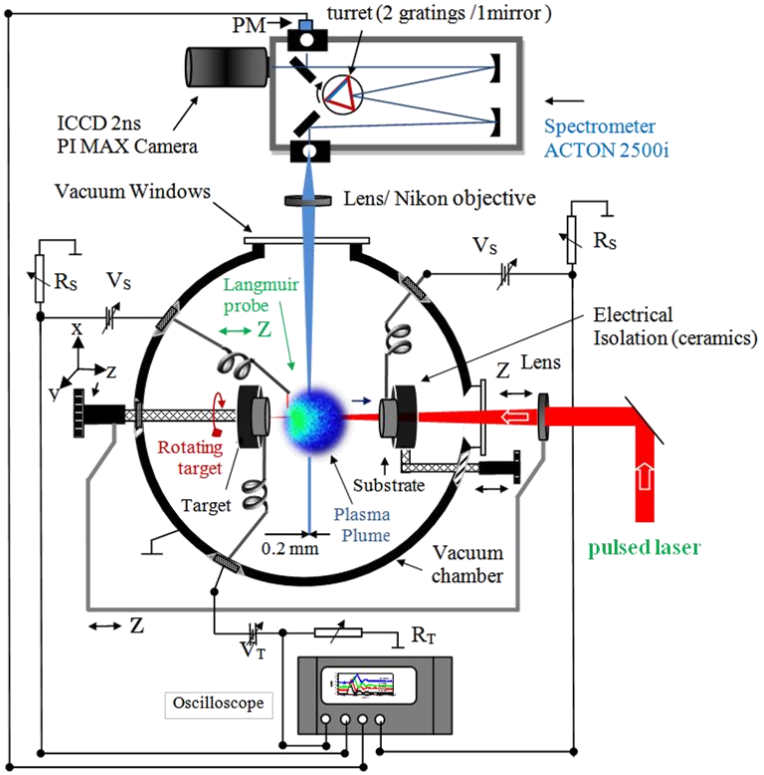



DACIA

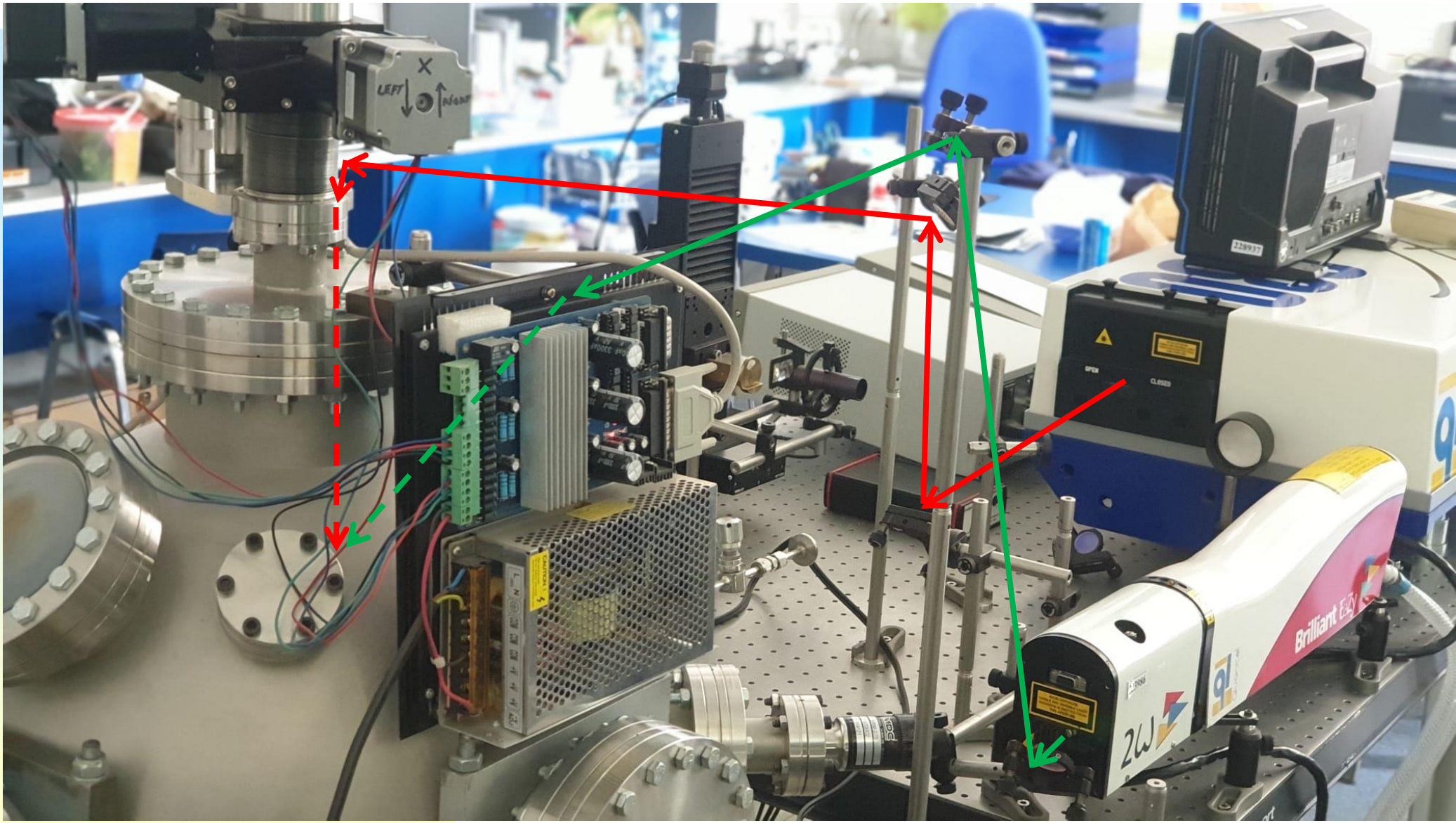

DANGER LASER

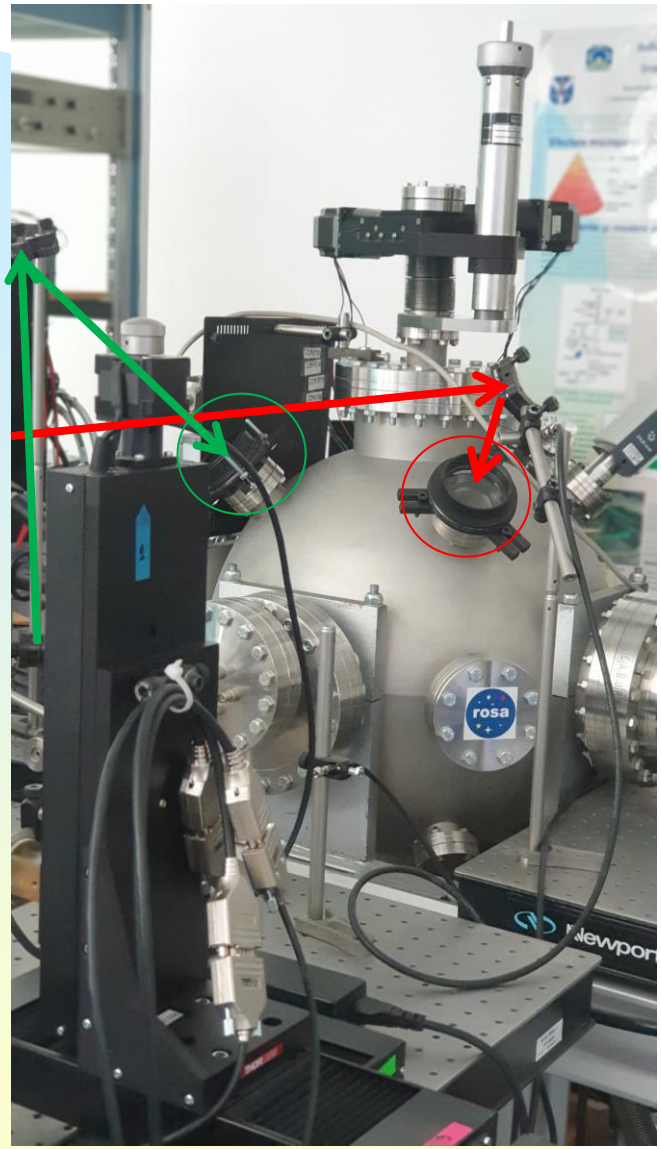






Experimental set-up


LEFT
RIGHT
Brilliant B&W
2W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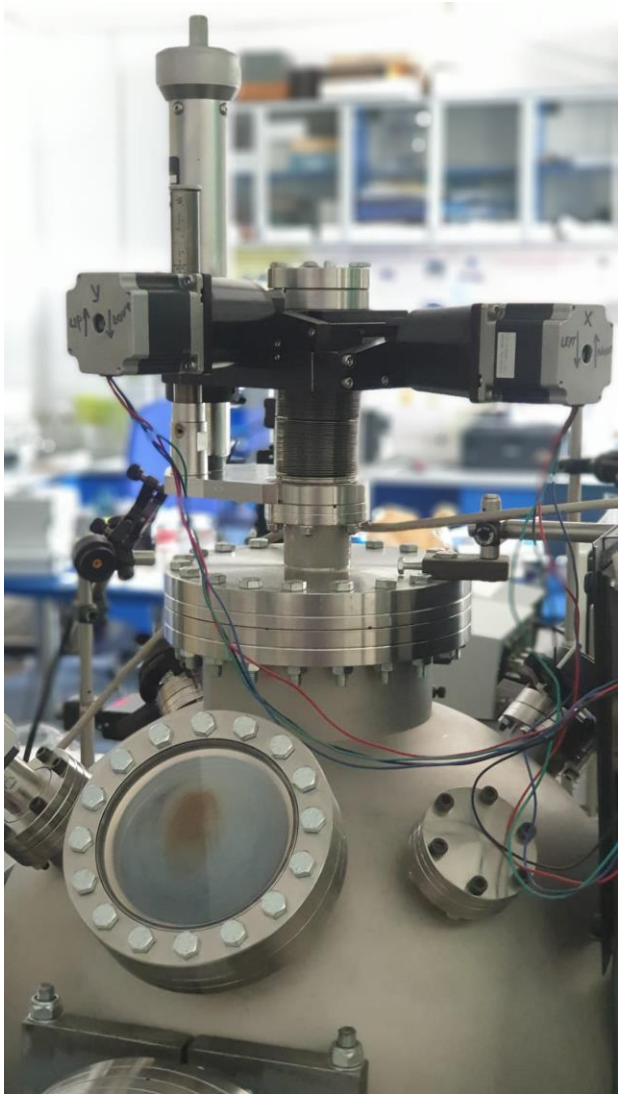
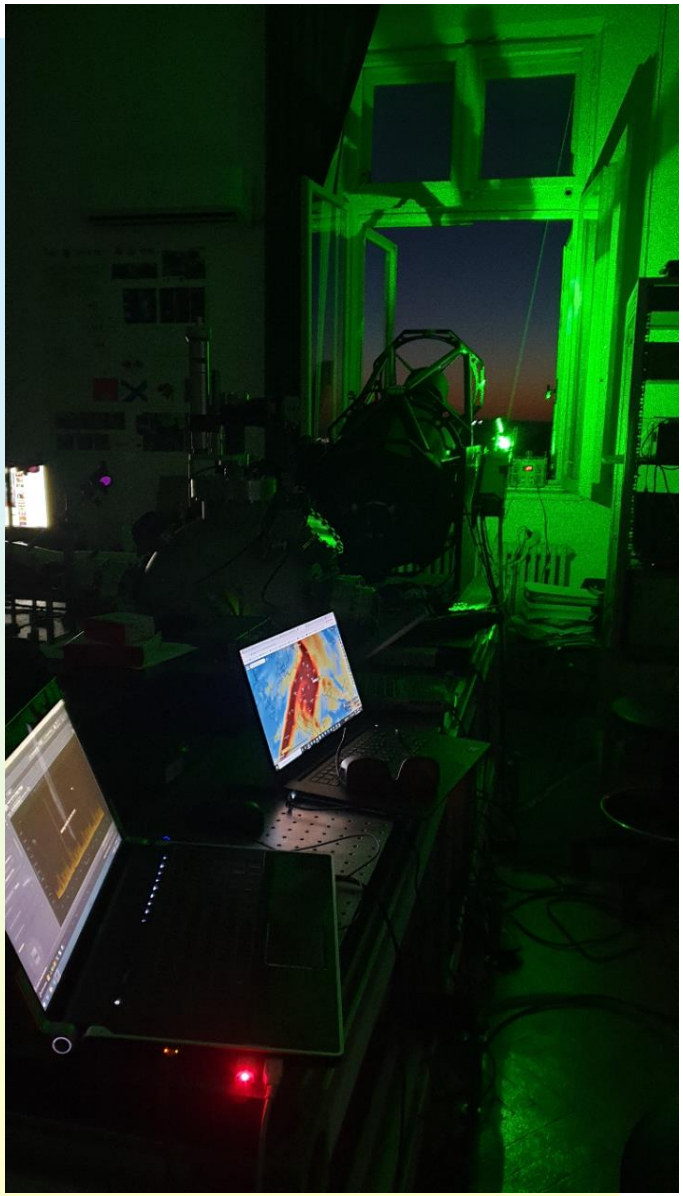
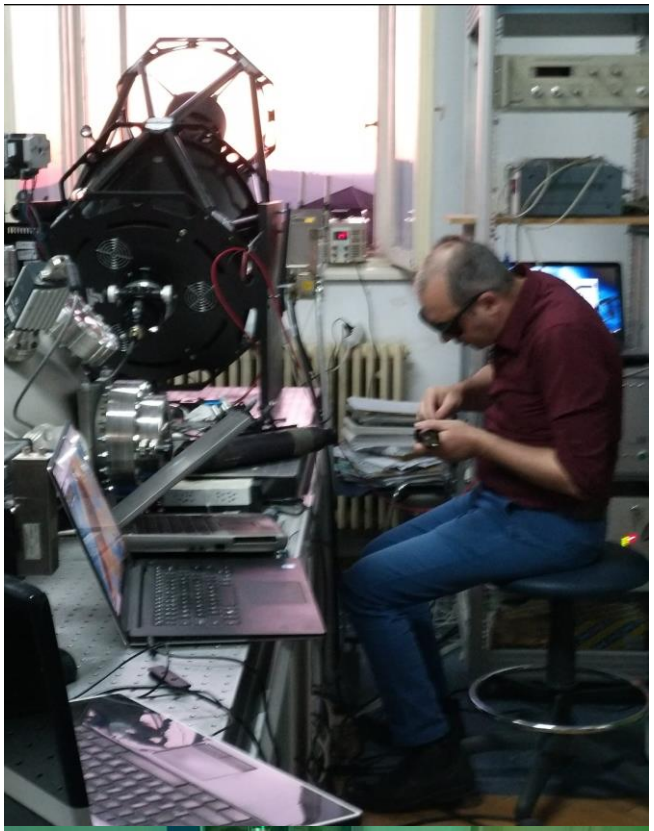
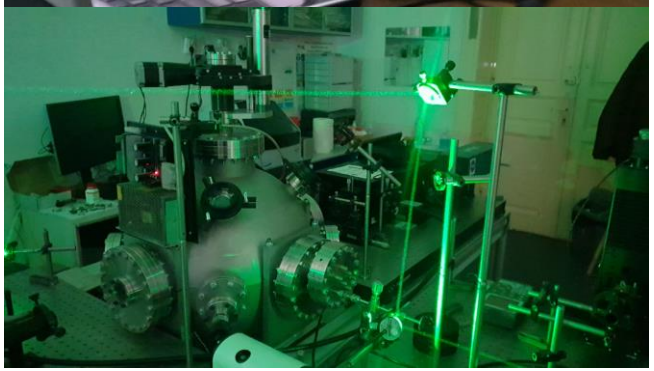
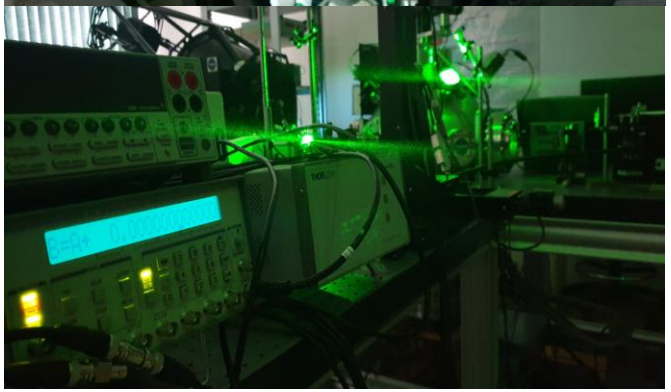
THORLABS

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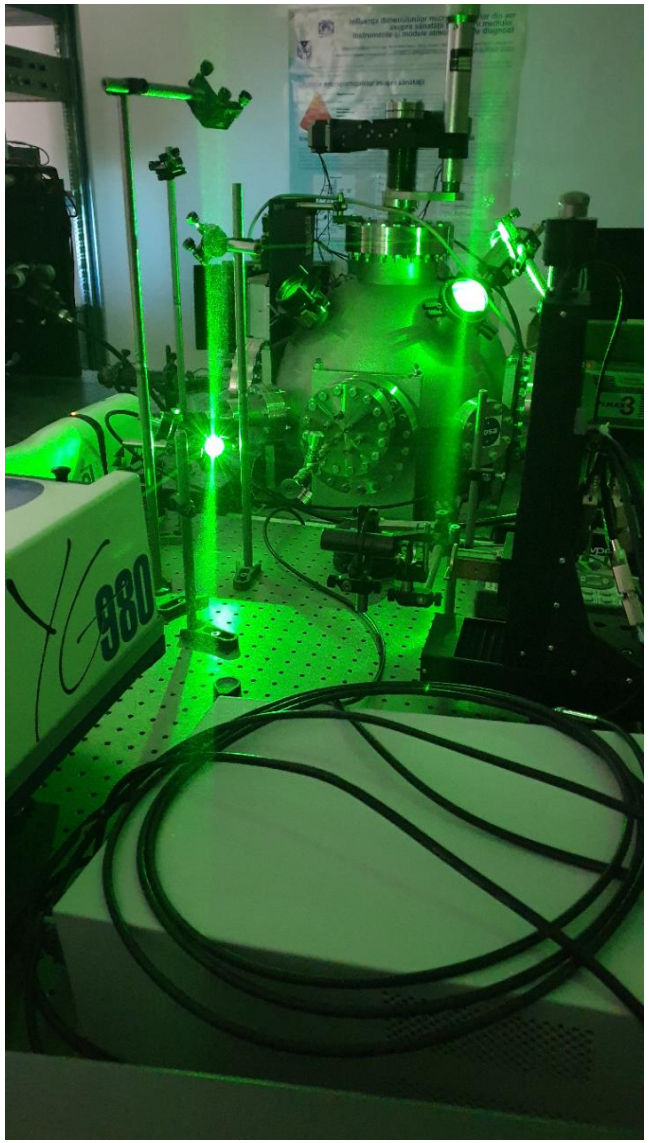
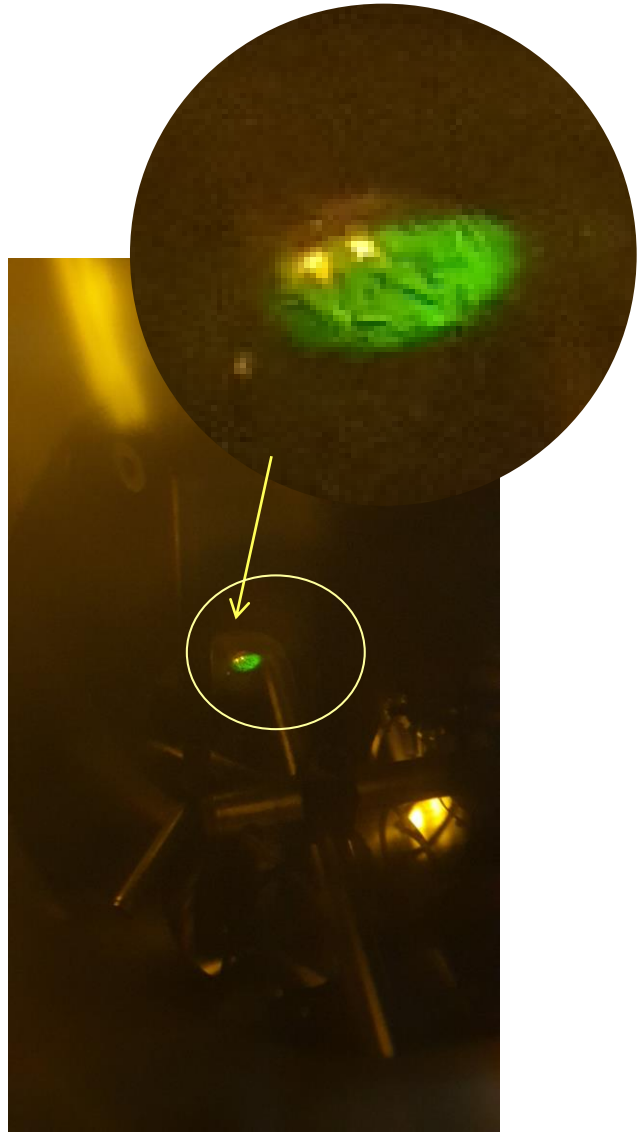

980

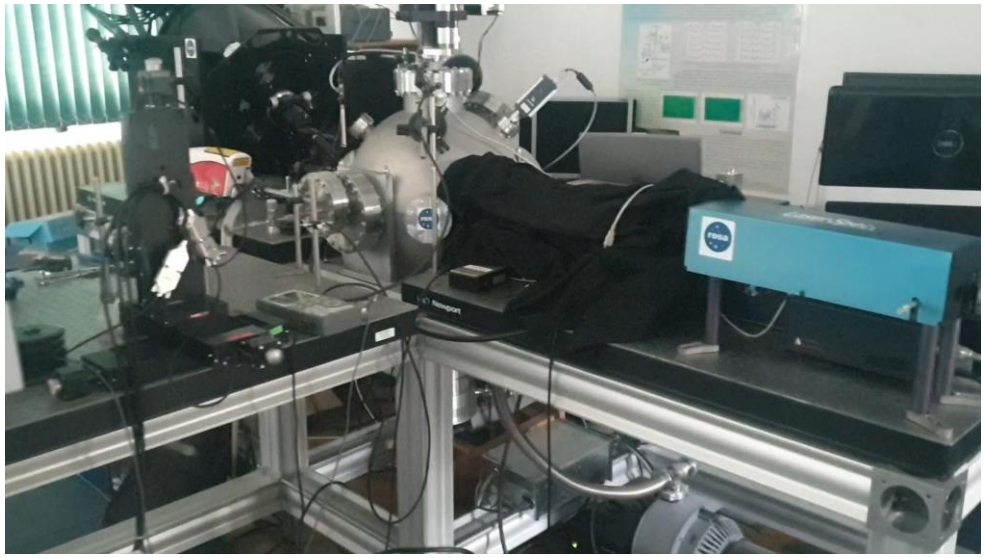


eli

agenția spațială română
rosa
romanian space agency

Metode de obtinere si caracterizarea a plasmei de ablatie laser in faza de depunere a straturilor subtiri PLD

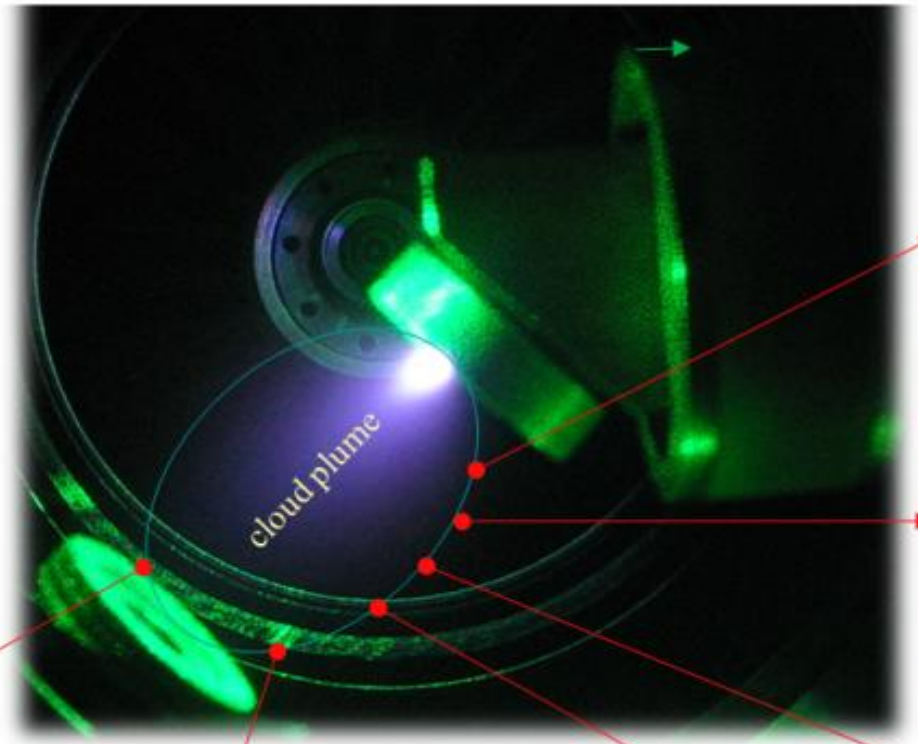
LIBS



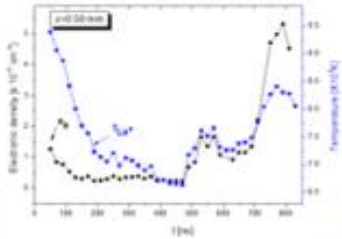
LASER ABLATION SPECTROSCOPY

OES

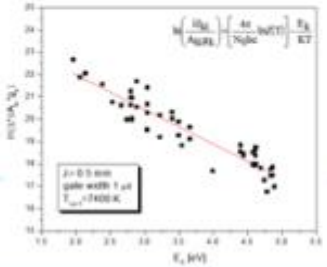
Systematic study on the influence of various experimental conditions on the behavior and dynamics of the transient cloud plume



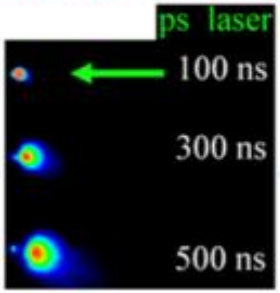
Temporal excited temperatures and electronic density profiles



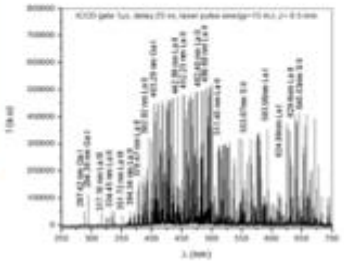
Average ion excited temperature dependence (Boltzmann plot)



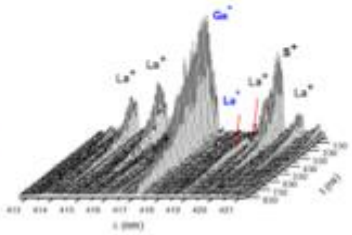
Temporal evolution of the integrated optical emission



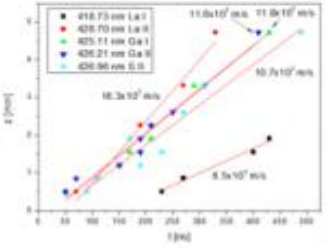
Optical emission spectrums



Optical emission time–of-flight profiles recorded for a broad range of neutrals and ions spectral lines.



Space-time evolution of different species



INTERACTIUNEA LASER- MATERIE

LASERI :

- **nanosecondă** *(QUANTEL, CONTINUUM)*

  Nd:YAG : 1064, 532, 355 nm

  5-10 ns, < 400 mJ/pulse

  < 10^{10} W/cm^2

- **femtosecundă** *(Spectra Physics)*

  Ti:Sa : 800 nm (tunable OPA available)

  40 fs, 120 fs, 2 ps, < 2 mJ/pulse

  < 10^{14} W/cm^2

- **în undă continuă** *(IPG)*

  laser fibrat, 1070 nm

  < 300 W

  < 10^6 W/cm^2

MATERIALE:

- **ținte simple** *(Al, Cu, …) de interes fundamental*

- **ceramici** *($BNSiO_2$, Al_2O_3, MgO, …)*

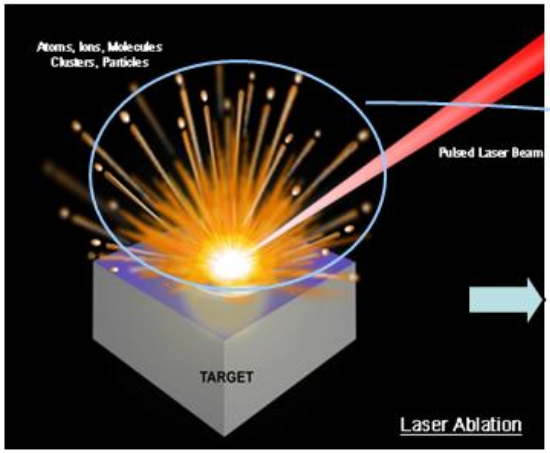
  folosite în varii aplicații (propulsie spațială)

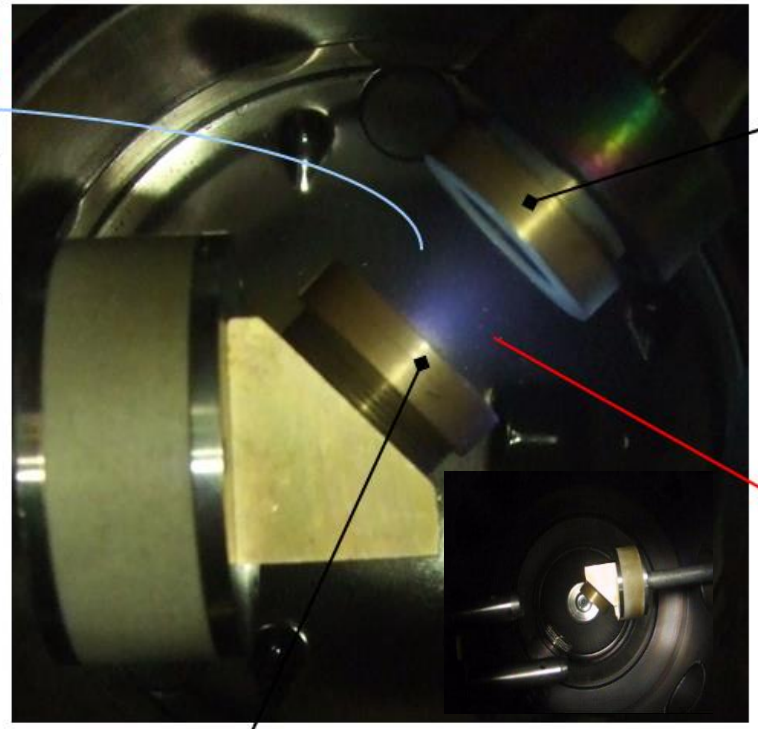
- **calcogenuri** *(Ga/Ge/Sb/S/La/Te/As/Se)*

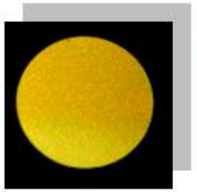
- **ferite compozite** *($CoFe_2O_4$ - $BaTiO_3$)*

- **varii materiale optice**

Laser ablation: fundamental and applications







PLD thin films:

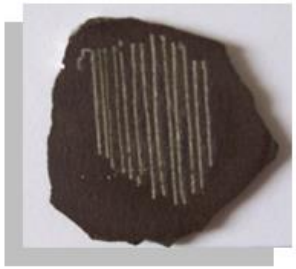
SEM, XPS, XRD, AFM, Ellipsometry

PLD UV-chalcogenide and cobalt ferrite deposition

Analysis of the gas phase (plasma plume) produced by laser ablation

TOF, ICCD image plasma, laser induce fluorescence (LIF), particle image velocimetry (PIV), time-resolved shadowgraphy, interferometry, Langmuir probe electrical plasma diagnosis

- elucidate the complex physical processes of laser ablation plasma
- depositing multi-element materials, study the quality of the synthesized layers
- novel applications

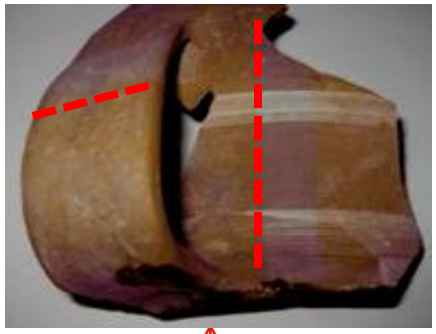


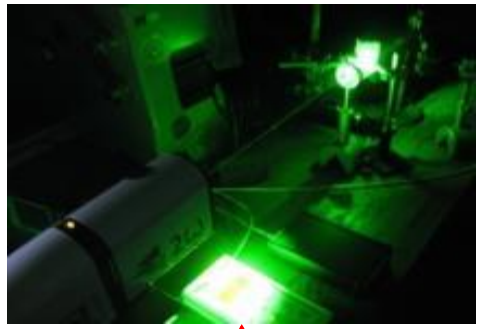
Different types of targets (ceramics, chalcogenide, cobalt ferrite composite, metals, photo-polymers, doped photo-polymers) of interest both for fundamental and applied research (Hall effect thrusters, micro laser plasma thrusters, Laser Direct Patterning)

Laser ablation plasma spectroscopy. Experiments and Modelling

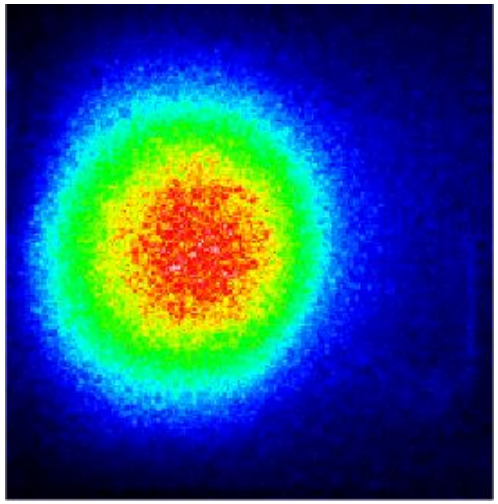
1. *Plume dynamics analysis : electrical and optical emission spectroscopy;*
2. *Space and time resolved Optical Emission Spectroscopy (OES);*
3. *Pulsed laser deposition of thin films. Samples morphology, composition and physical properties:* Raman, Optical Surface Profilometry, XRD, XPS, Elipsometry, SEM/EDAX
4. *Simulation and theoretical model approach. Implementation of novel source code written in Python programming for the analysis and interpretation of experimental data.*

Applications: ***cleaning and restoration of art of works***

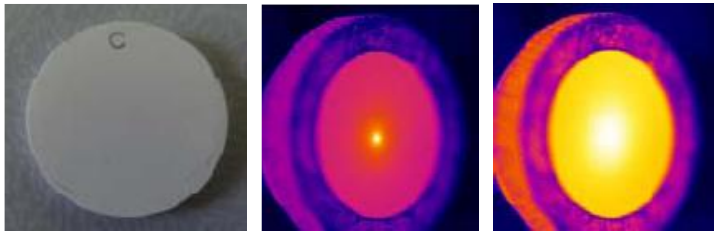




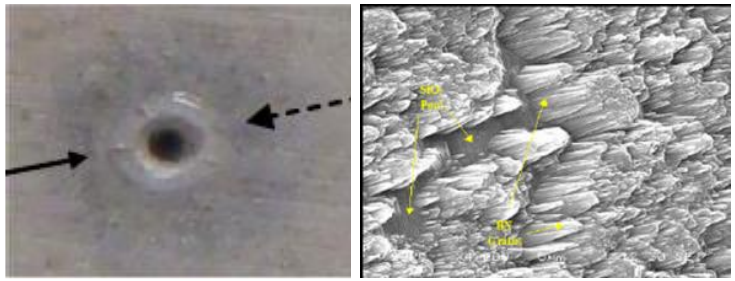
METODE DE INVESTIGARE



- ***Analiza fazei gazoase***
  - *imagerie ICCD (2 ns) a plumei de ablatie laser (10 km/s)*
  - *spectroscopie rezolvata temporal si spatial*
  - *sonde Langmuir*
  - *spectrometrie de masa*

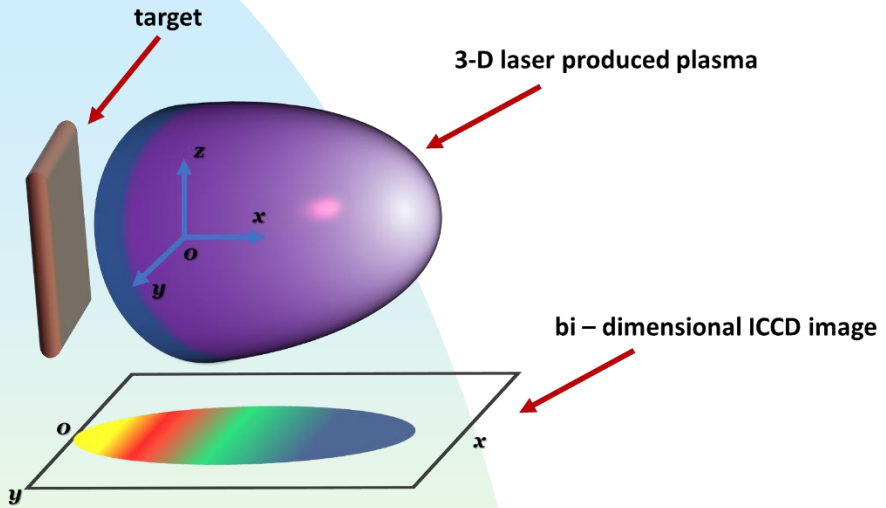


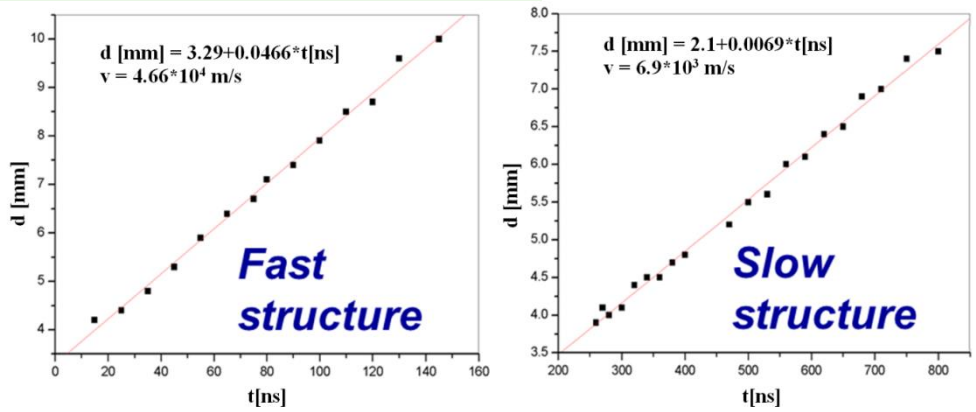
- ***Monitorizare in timp real a calitatii optice***
  - *tomografie IR … regim laser in unda continua*



- ***« A posteriori » analiza fazei solide … tinta si straturi subtri***
  - *Microscopie electronica de baleiaj (SEM, EDAX)*
  - *Profilometrie, TOF-SIMS*
  - *Raman, Ellipsometrie …*

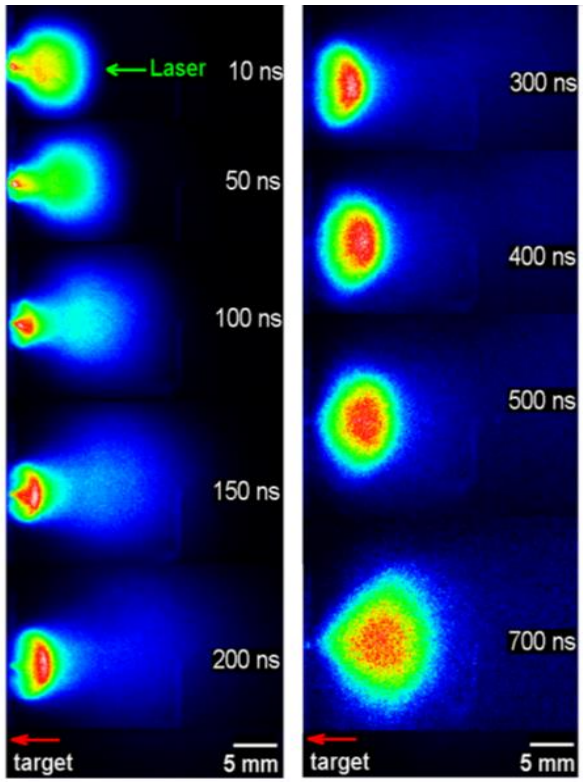
ICCD PIMAX-3 imagerie plasmă tranzitorie laser PLD

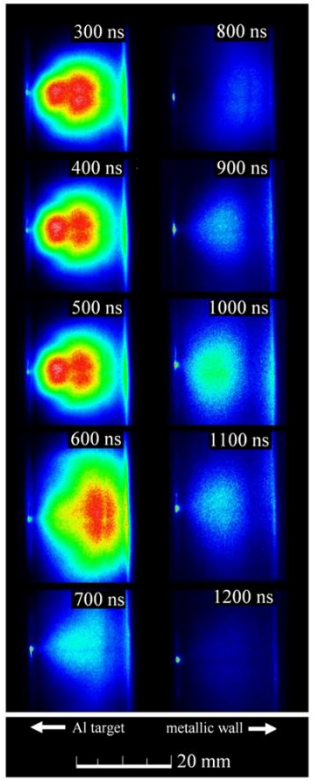




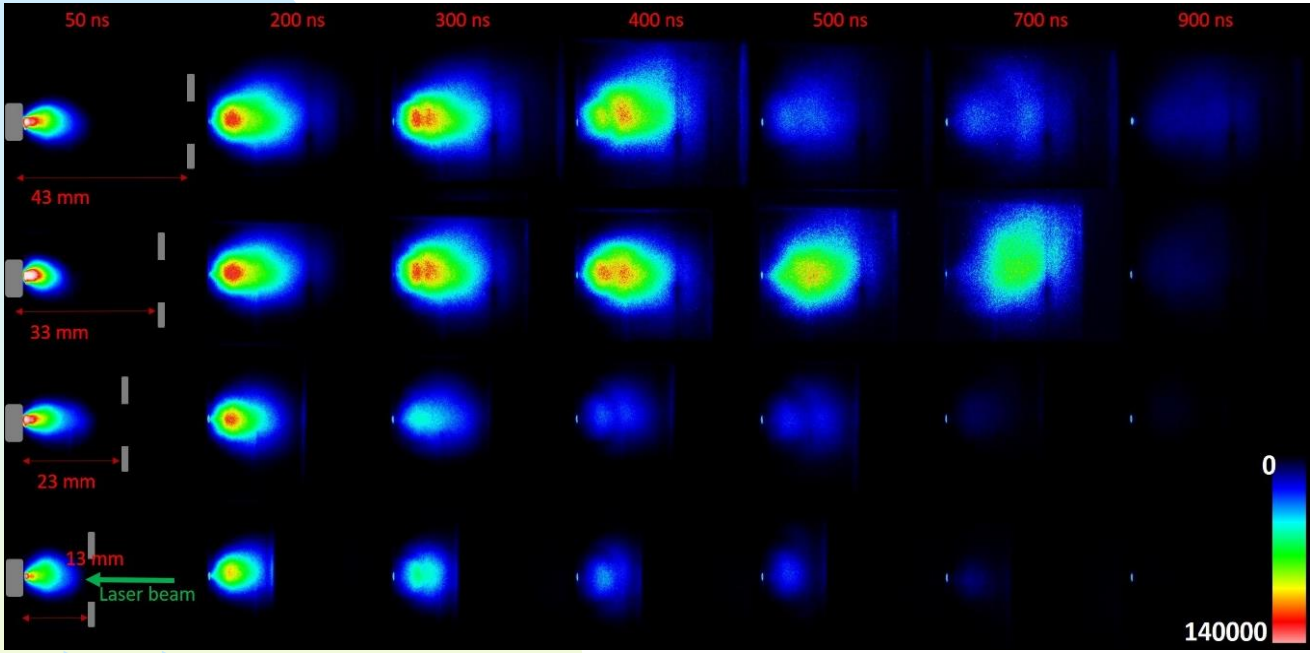
expansiune liberă

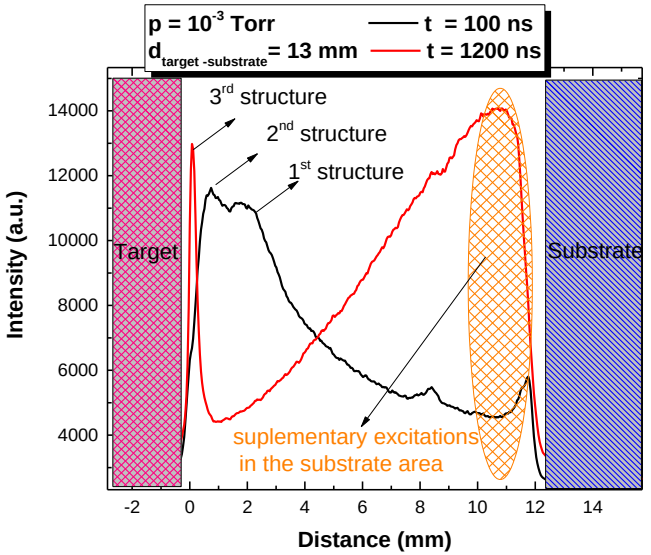
condiții reale PLD

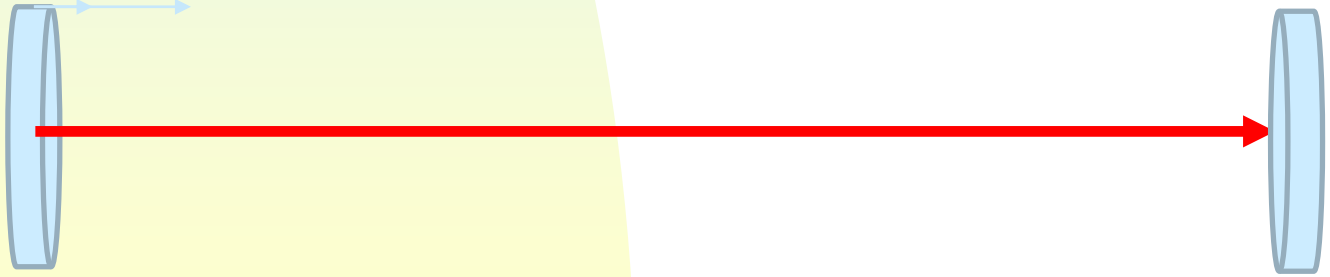




Efecte ale evolutiei plumei de ablatie laser: fenomene tranzitorii si oscilatorii



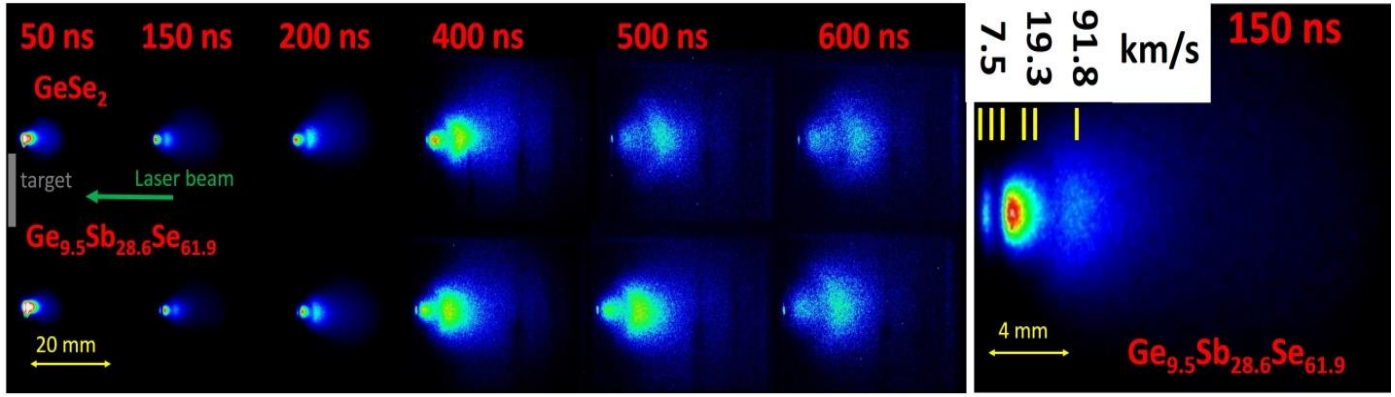


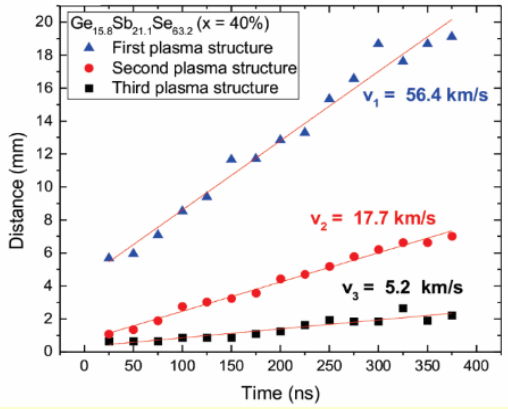


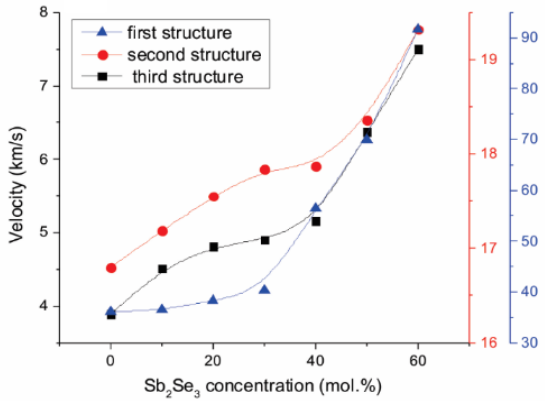
Țintă

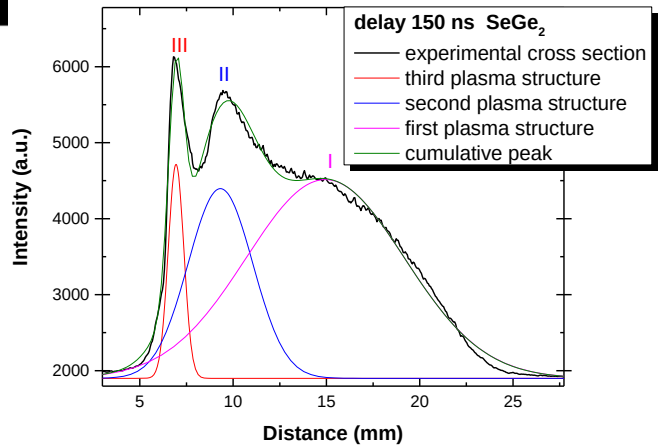
Substrat (lentilă)

Investigații optice







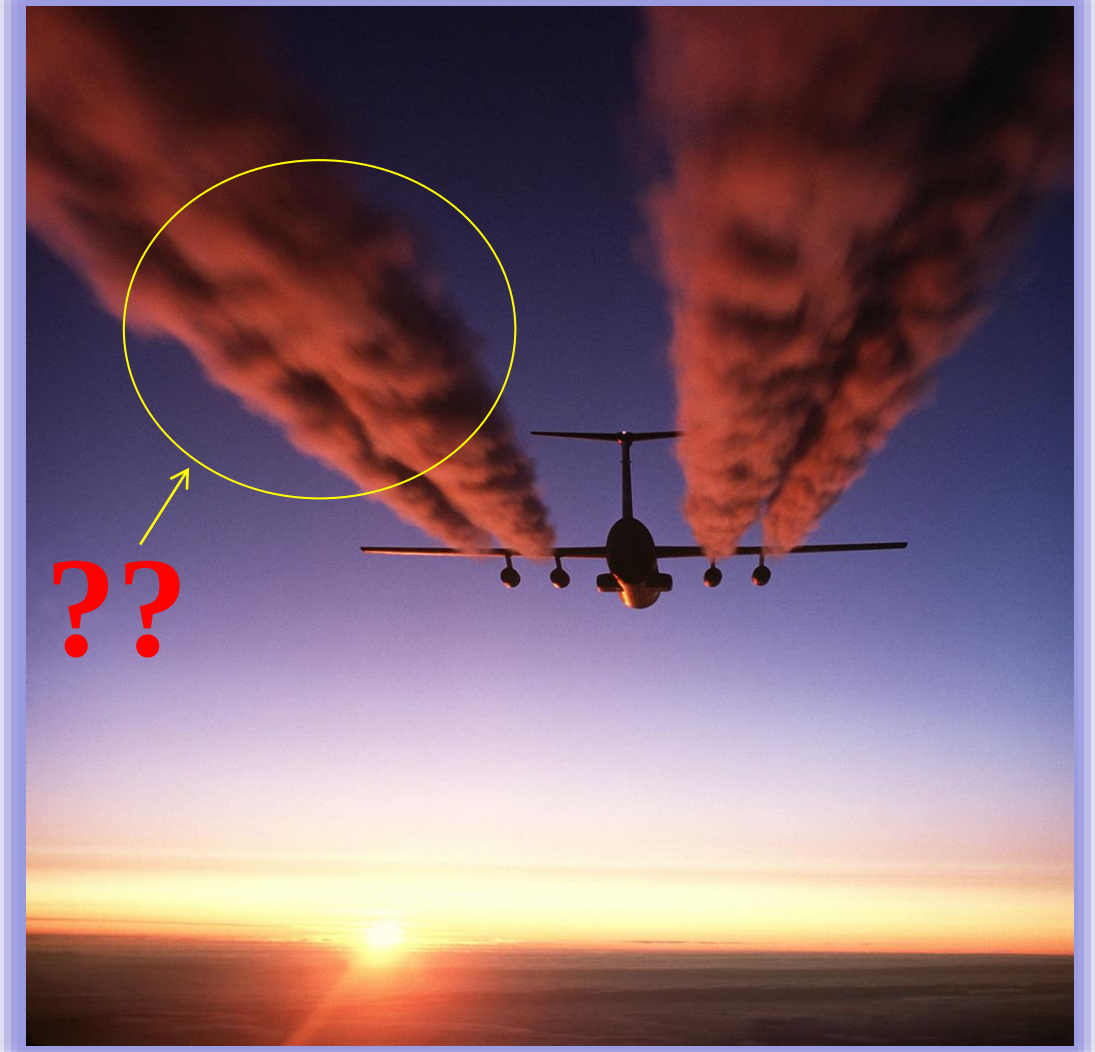


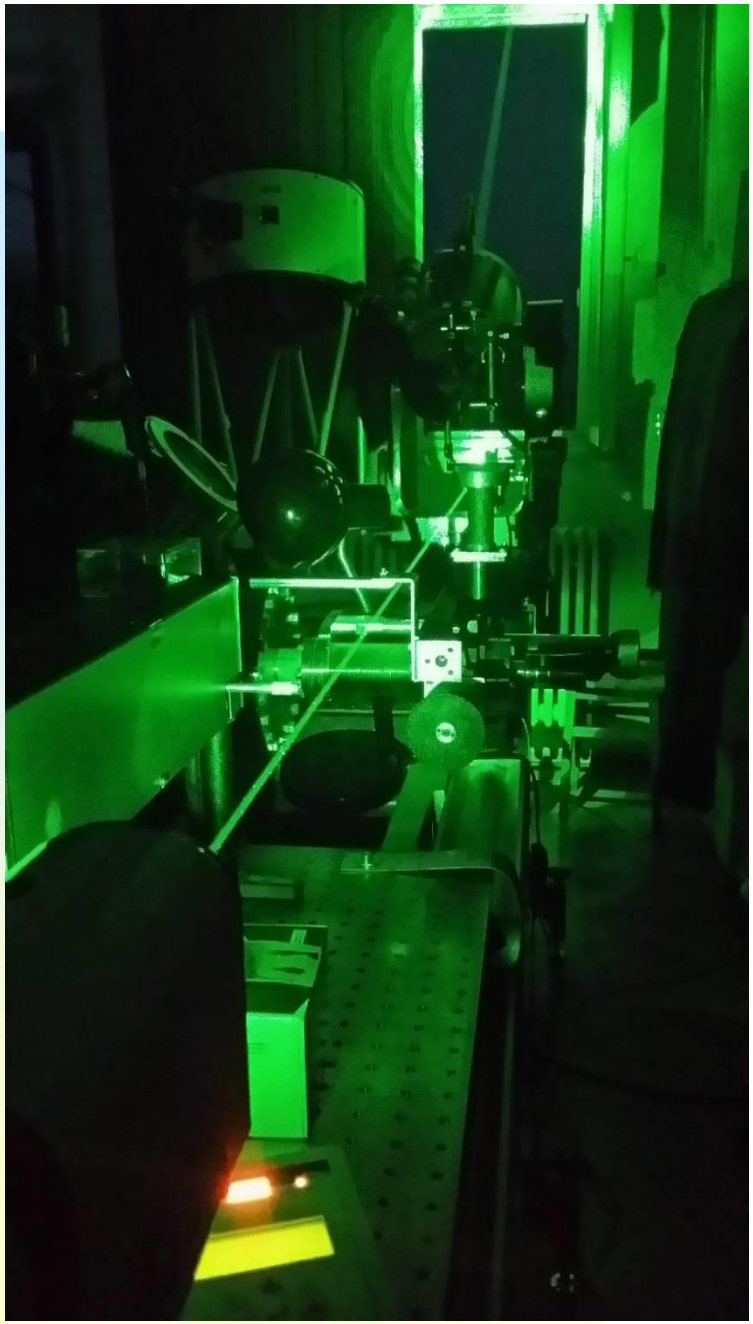
Irimiciuc *et al.*, *Appl. Surf. Sci.*, *419*, 594-600, 2017.

Aerosols emitted and formed as a result of aviation are difficult to quantify because of numerous parameters: aircraft type, fuel consumption, altitude, meteorological conditions, region type, etc.

Aircraft engines emit a mixture of particles (including metal particles and neutral and ions) and gases (e.g., SO2), soot-PAH (combustion) and sulphuric acid (H2SO4) from sulphur in the aviation fuel. These particles are capable of seeding contrails and cirrus clouds, thus potentially changing the total cloud cover in the upper troposphere.

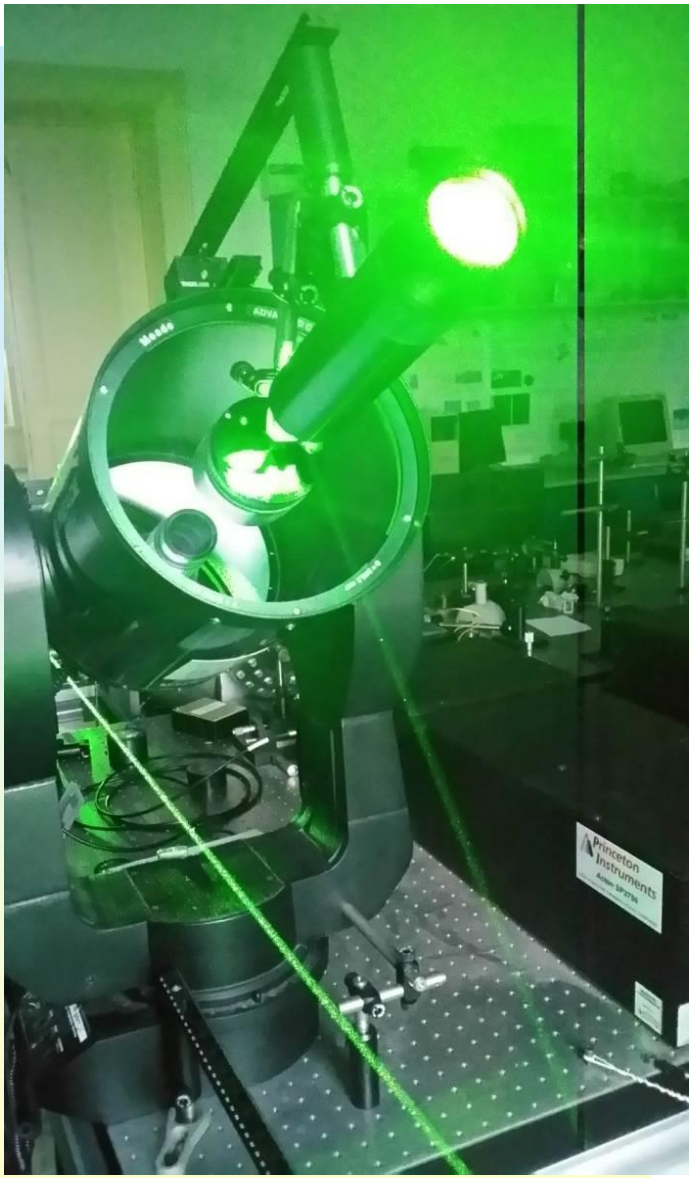
Particles are also involved in the chemical balance of the atmosphere. It is well established that the sulfate aerosol layer in the stratosphere is critically important in determining the NOx budget there; any long-term changes in the surface area of particles would affect stratospheric NOx, hence ozone.





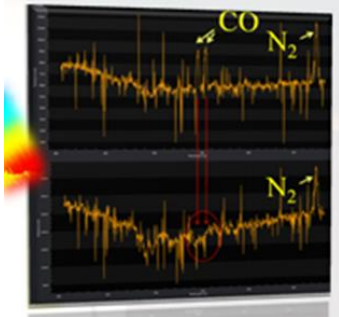
Spatial resolution:
1 cm

Temporal resolution:
2 ns



Advanced Optical Remote Sensors for Airborne and Spaceborne Platforms

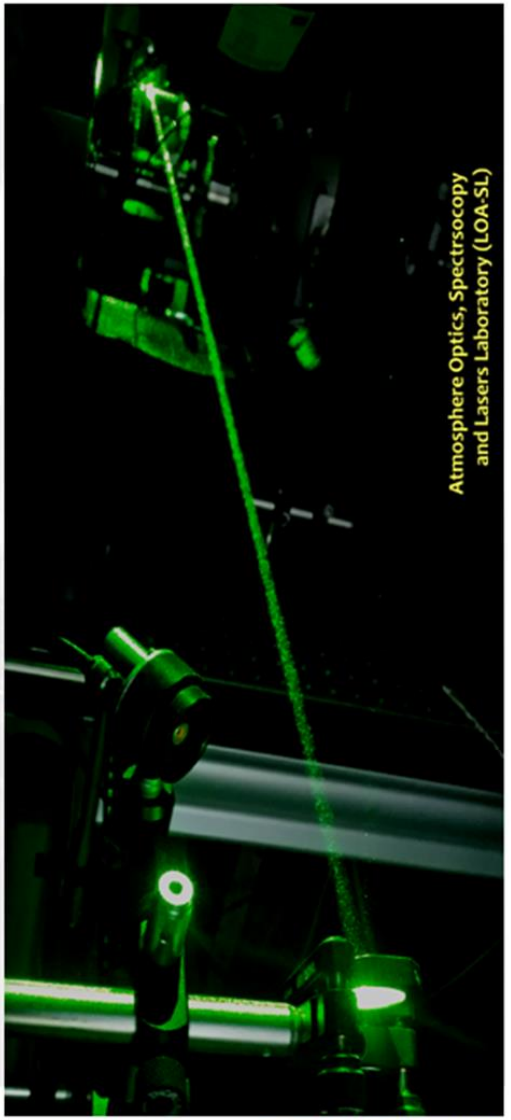
Long distance remote laser induced RAMAN & breakdown spectroscopy



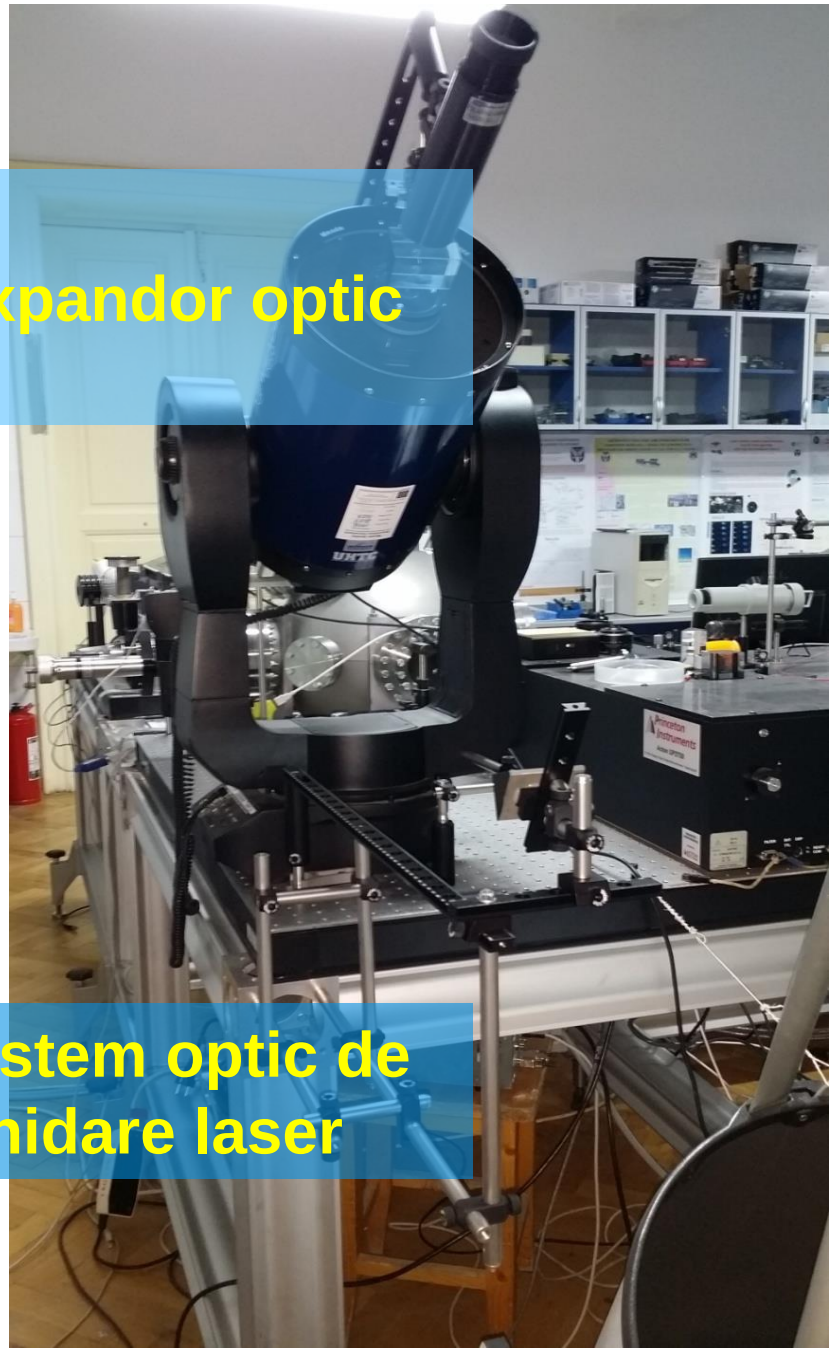
The fasted LIDAR resolved spectroscopy

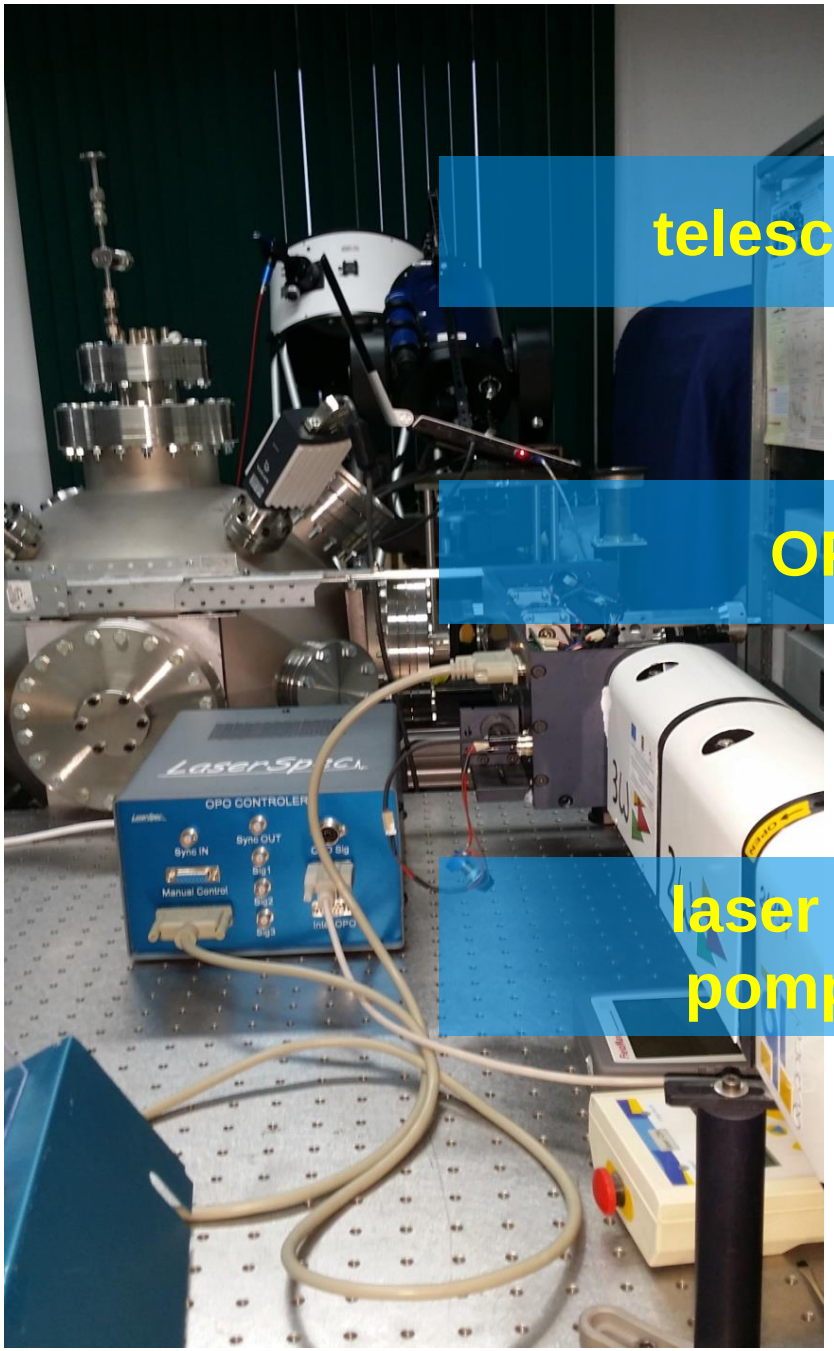
Physico-chemical properties of the atmosphere compound behavior

2 ns temporal resolution, 1 cm spatial resolution

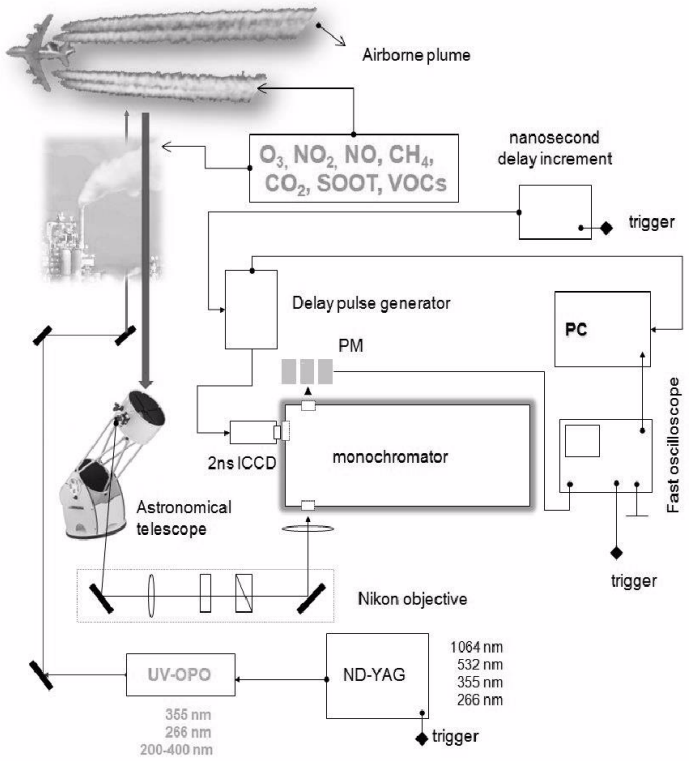


spectroscopy.phys.uaic.ro


expandor optic
sistem optic de ghidare laser


telescop
OPO
laser de pompaj
OPO CONTROLER
Sync IN
Sync OUT
Manual Control

Atmosphere self-cleaning under humidity conditions and influence of the snowflakes and artificial light interaction for water dissociation simulated by the means of COMSOL

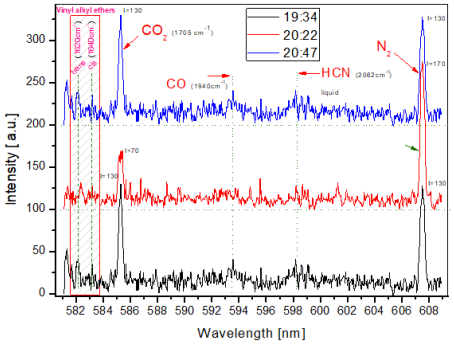


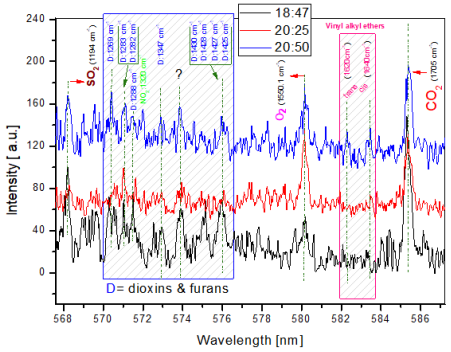
DARLIOES experimental set-up: the fasted LIDAR resolved spectroscopy

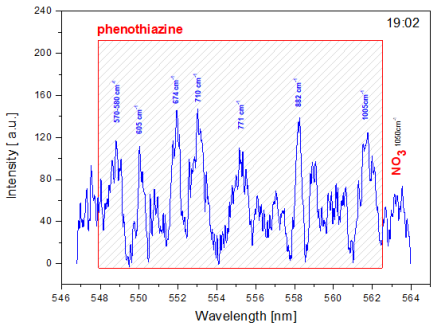
A. Cocean, I. Cocean, M.M. Cazacu, G. Bulai, F. Iacomi, S. Gurlui, Atmosphere self-cleaning under humidity conditions and influence of the snowflakes and artificial light interaction for water dissociation simulated by the means of COMSOL, Applied Surface Science, 2018, DOI: 10.1016/j.apsusc.2018.02.156, Accepted manuscript available online: 16-FEB-2018

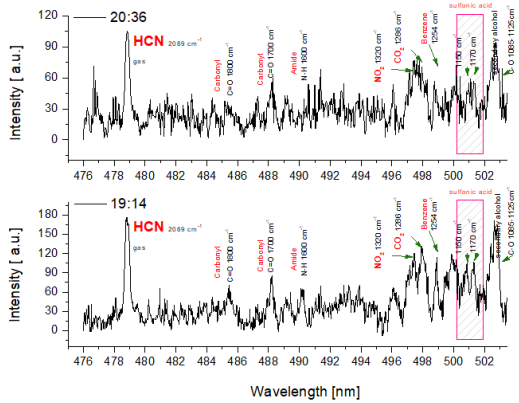
Atmosphere self-cleaning under humidity conditions and influence of the snowflakes and artificial light interaction for water dissociation simulated by the means of COMSOL

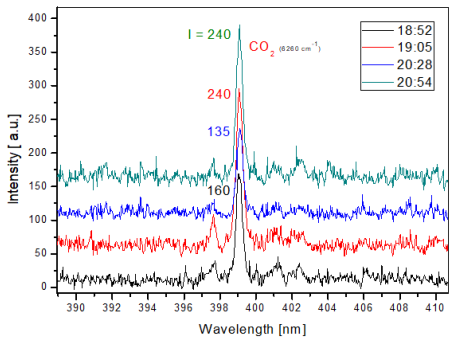
Atmosphere chemical composition RAMAN spectra recorded with DARLIOES System

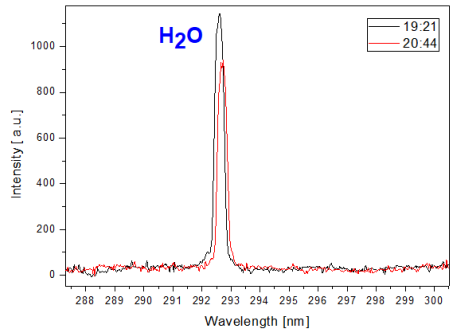


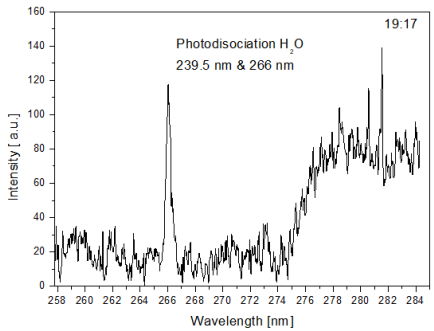


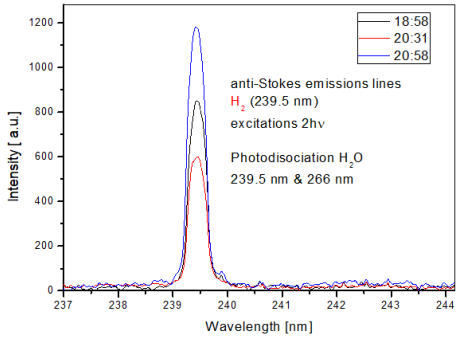


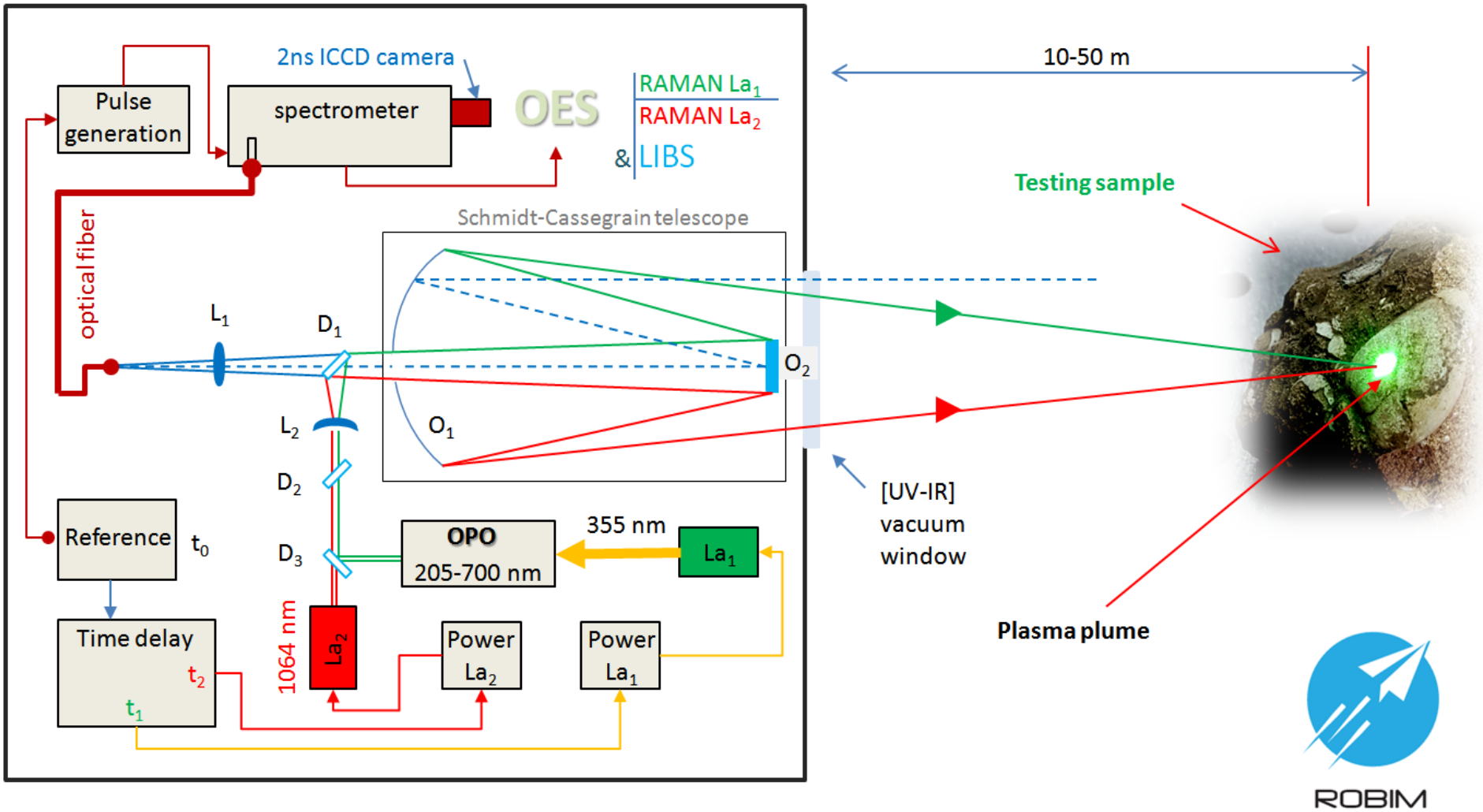


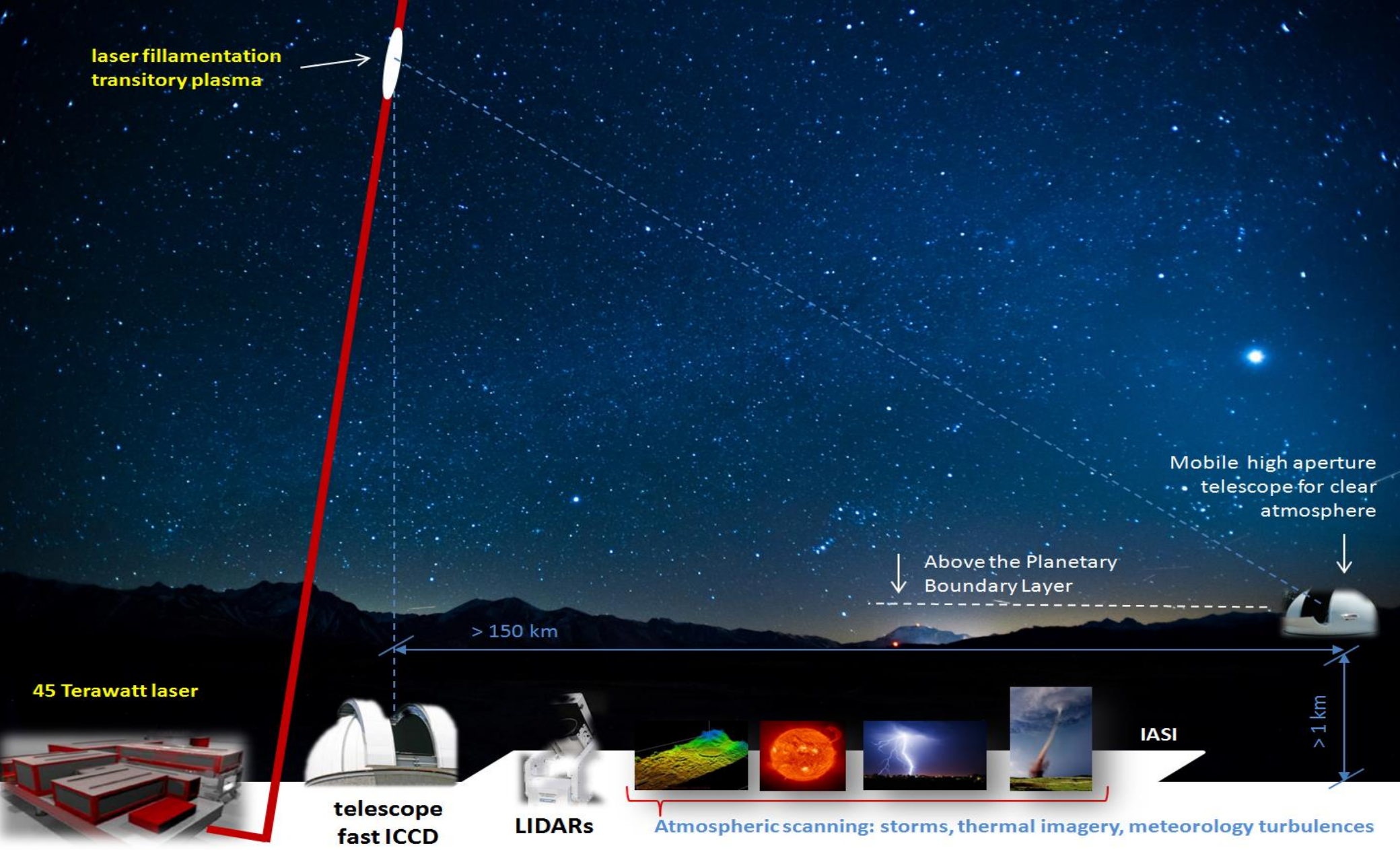









2ns ICCD camera
Pulse generation
spectrometer
OES
RAMAN La1
RAMAN La2
& LIBS
optical fiber
Schmidt-Cassegrain telescope
L1
D1
L2
D2
D3
O1
O2
Reference
t0
OPO
205-700 nm
355 nm
La1
Time delay
t2
t1
1064 nm
La2
Power La2
Power La1
10-50 m
Testing sample
[UV-IR]
vacuum
window
Plasma plume
ROBIM


laser fillamentation
transitory plasma
Mobile high aperture
telescope for clear
atmosphere
Above the Planetary
Boundary Layer
> 150 km
45 Terawatt laser
IASI
> 1 km
telescope
fast ICCD
LIDARs
Atmospheric scanning: storms, thermal imagery, meteorology turbulences