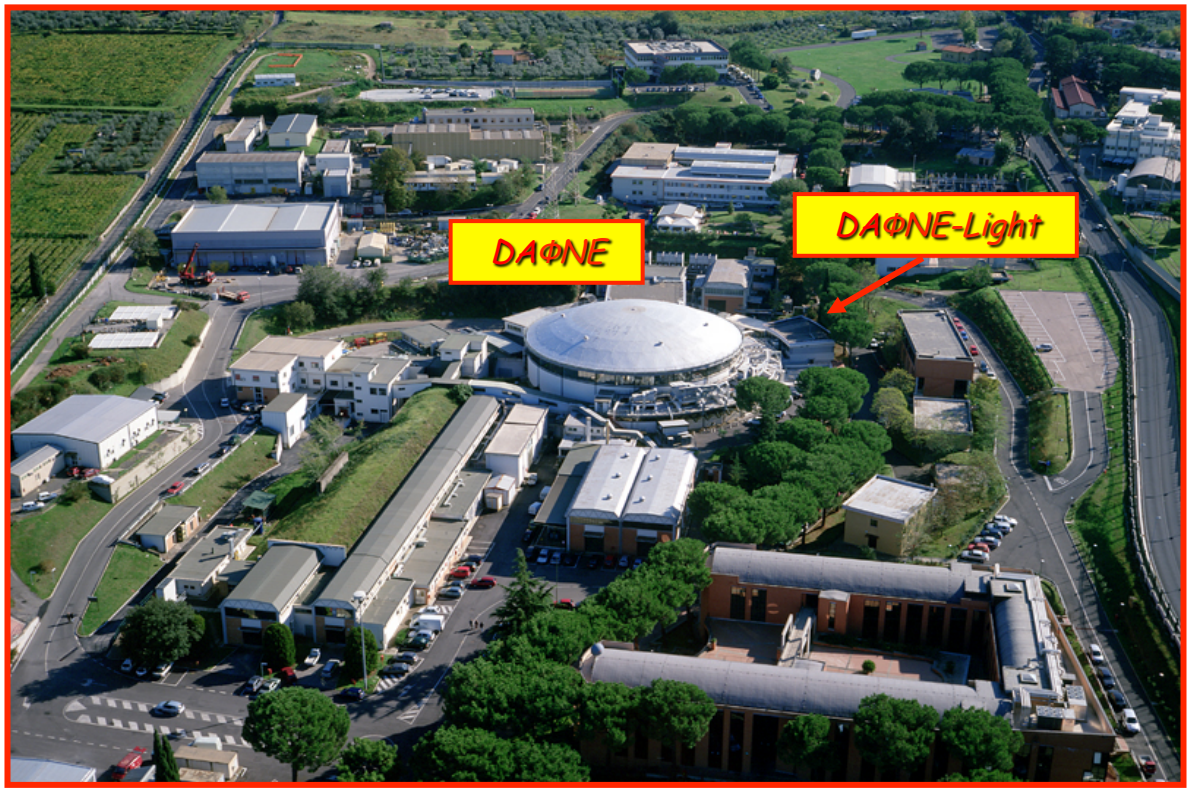
DAΦNE-Light

INFN-LNF Synchrotron Radiation Facility



Antonella Balerna

INFN-LNF C. L. Aperto 6-7 July 2011

Beamlines @ DAΦNE

SINBAD -IR beamline

DXR1-Soft x-ray beamline

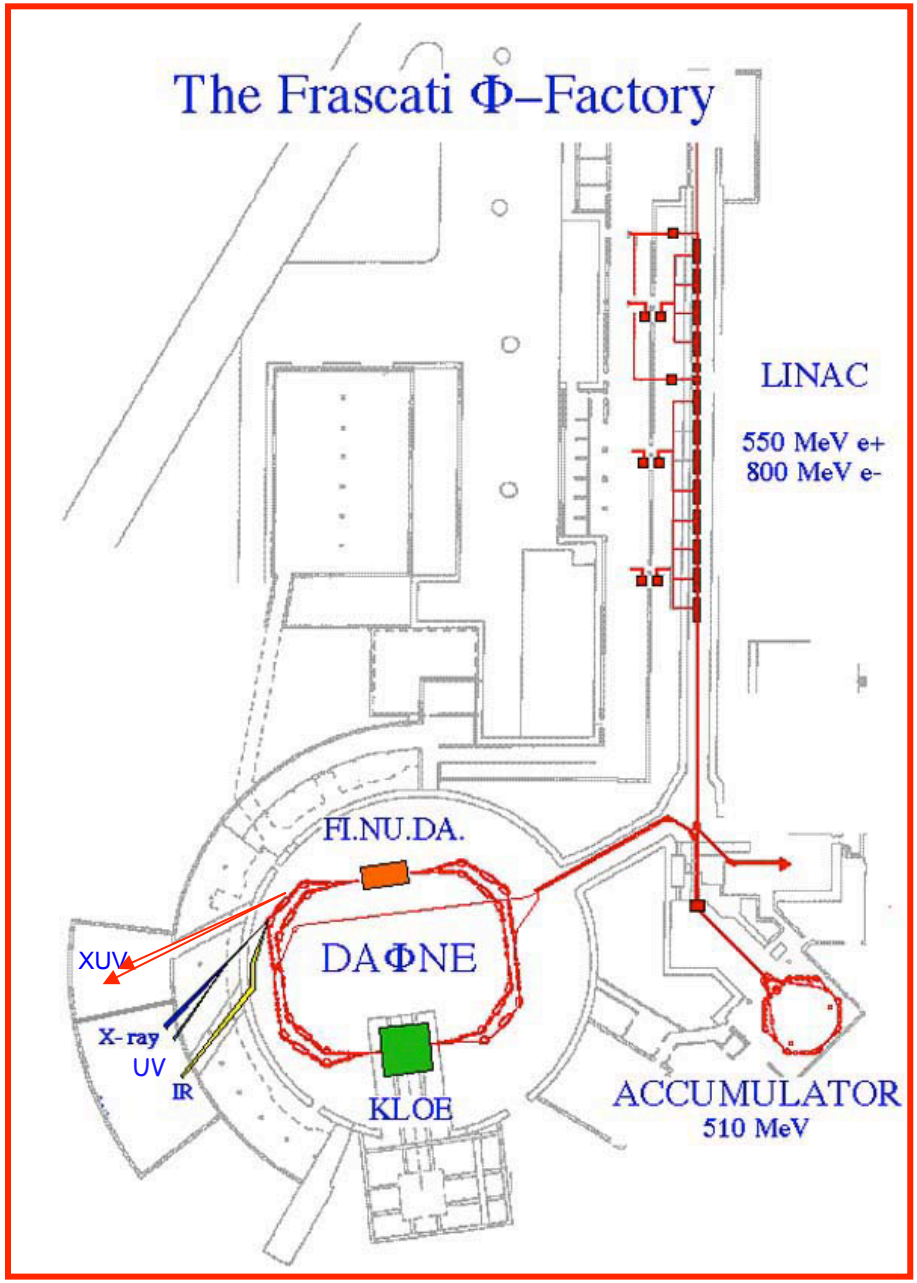
Open to Italian and EU users

DXR2 - UV beamline new setup ready in 2011

2 new XUV beamlines

Low Energy Beamline (35-200 eV) ready for commissioning in 2011;

High Energy Beamline (60-1000 eV) commissioning in 2011



Scientists involved

DXR1 - Soft X-ray beamline - Antonella Balerna

DXR2 - UV beamline - Emanuele Pace (Univ. Firenze) collaborations with Antonio De Sio (Contract Univ. Firenze) - Lisa Gambicorti (Contract CNR-INOA)

SINBAD - Infrared beamline - Mariangela Cestelli-Guidi (INFN Art. 23) - Chiara Mirri (EU contract August 2011) - Seydoo Yao (PhD student)

DXUV- New XUV beamlines - Roberto Cimino - Mario Commisso (Ass. Ric. LNF up to April 2011) - Davide Remo Grosso (PhD student up to Dec 2011)

- External collaborators: Rosanna Larciprete (CNR-ISC), Roberto Flammini (CNR-IMIP)

Technical staff - Servizio LDS

Antonio Grilli, Agostino Raco, Marco Pietropaoli,
Vittorio Sciarra, Vinicio Tullio and Giacomo Viviani

Secretariat

Silvia Colasanti

OTHER SERVICES INVOLVED IN THE UPGRADE OF THE DAΦNE-L BEAMLINES and LABORATORY

Servizio Elettronica ed Automazione – Reparto Automatismi e Controlli – Divisione Ricerca

2011/2012

-Nuove Linee XUV- *Richiesta realizzazione del sistema di controllo valvole, sicurezze e vuoto anche per la seconda linea HEB XUV.*

-Linea UV-VIS *- Richiesto sistema di controllo e acquisizione dati con nuovo PC; controllo e gestione del nuovo monocromatore da vuoto della ditta Jobin Yvon inclusa movimentazione della tavola PI sincrona per movimento del reticolo.*

Luigi Pellegrino & Divisione Tecnica

Camera pulita ***ISO 7*** *per la preparazione di campioni biologici.*

Activity
2010 - 2011 - 2012

Activities at the DAΦNE-Light Beamlines

The **IR** and the **Soft X-ray** beamlines are **already open to users**. Beamtime given to **Italian** and **EU users**, in the framework of the **INFN-Group V experiments**, of collaborations with **Italian Universities**, of the Transnational Access to Research Infrastructures (**FP7 E.Li.S.A.** (**August 2011**)) **program** and of **collaborations** using **F.A.I.** (**2010/2011**).

2010 -2011 IR beamline

186 days - 24 DAΦNE dedicated beamtime days

20 different teams Italian and EU

The **new setup** of the **UV branch** line **completed in 2011.**

Of the two **new XUV beamlines,** the one with the **energy range (35-200) eV is ready for commissioning**, while the **high energy one** will be ready by the end of **2011**.

Integrated Infrastructure Initiative (I3) - FP7
E.LI.S.A.
European LIght Sources Activities

E.LI.S.A.

has two strategic objectives:

1 to ***support transnational users of national facilities*** in the domain of ***synchrotron*** and ***FEL science***;

2 to ***support joint research activities*** (JRAs) with the purpose of: ***a***) ***enhancing the effectiveness of the facilities*** in giving beamtime to users and in particular transnational users. ***b***) contributing to the ***development of novel sources*** in this domain

2012 - The ***EU project E.LI.S.A.*** will end in ***August 2011***- A new proposal will be submitted in the Call that will be opened at the end of ***July 2011*** – If accepted ***new EU project by May 2012***.

E.LI.S.A. is a program for ***research cooperation involving 17 laboratories and institutions throughout Europe***. This corresponds to the ***world largest network of synchrotron and FEL facilities***.

Status of the DAΦNE-Light Beamlines

1) SINBAD-IR beamline: open to users + upgrades on IR instrumentation and new bio-lab

2) DXR2 UV beamline: new setup ready in 2011

3) VUV beamlines LEB : ready for commissioning in 2011; HEB: ready for commissioning by the end of 2011

4) DXR1 soft x-ray beamline: open to users + some upgrades and allignment

SINBAD
Synchrotron INfrared Beamline At DAΦNE

Mariangela Cestelli-Guidi (art. 23)

Attivita' linea IR 2010-2011-2012

Attivita' sperimentale 2010-2011

20 gruppi di utenti
186 giorni di misura, di cui **24** con LDS dedicata.

Progetti di ricerca in corso oltre E.Li.S.A.

Progetto 'Vinci' Italia-Francia: BORSE TRIENNALI PER DOTTORATI DI RICERCA IN CO-TUTELA -Titolo della tesi: Immagini FTIR ad alta risoluzione dell'interazione fibra-cellula per lo studio degli effetti patogeni dell'amianto

PRIN 2008 (LNF collaboration with UDR Roma3) -Materiale Extraterrestre Primitivo come memoria dei processi evolutivi nel Sistema Solare primordiale

Progetti nuovi presentati:

MAE 2010 "Near-field Fourier transform-infrared imaging of living cells"

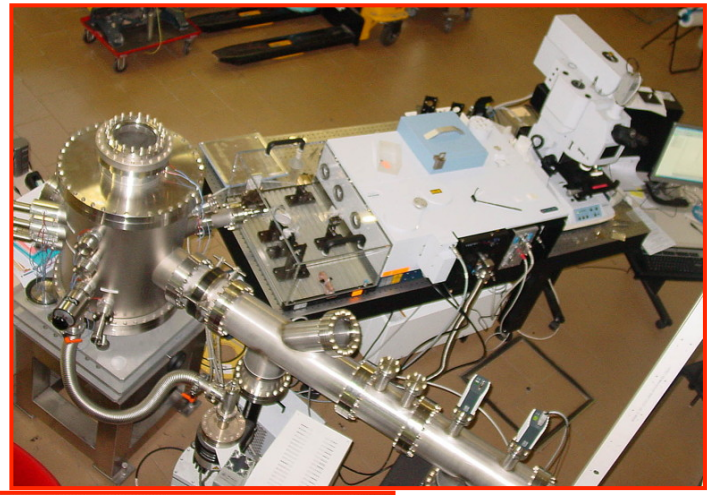
Nando Peretti Foundation 2011: "A new approach to map pediatric gastrointestinal inflammatory disease by **A**dvanced **I**maging and **M**etabolism of polyamines (**AIM**)"

Attivita' di laboratorio

- Realizzazione del ***prolungamento della beamline*** ed installazione della camera da vuoto e dello specchio torico di focalizzazione della LDS nella ***seconda stazione sperimentale***.
- Installazione seconda stazione sperimentale (***Vertex 70***) dedicata all'imaging ed alla microscopia IR (***40 kEuro da INFN Gruppo V***).
- Realizzazione e messa in opera della ***camera biologica pulita.***
- ***Installazione nella camera pulita della strumentazione*** di supporto agli esperimenti di biologia sul canale IR:

  - ***microtomo*** per effettuare sezioni sottili di tessuti biologici

  - ***strumenti di conservazione e manipolazione dei campioni biologici*** (freezer -80°C, contenitore LN_2, centrifuga, bagno termico, incubatore, microscopio invertito per colture cellulari, sistema di sterilizzazione H_2O)

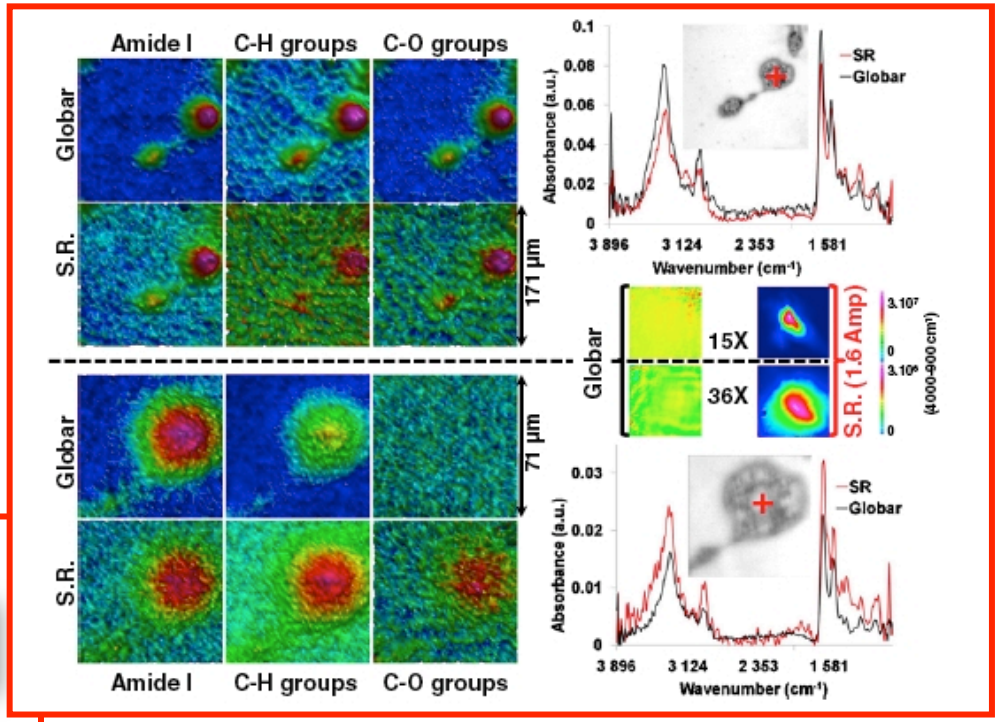


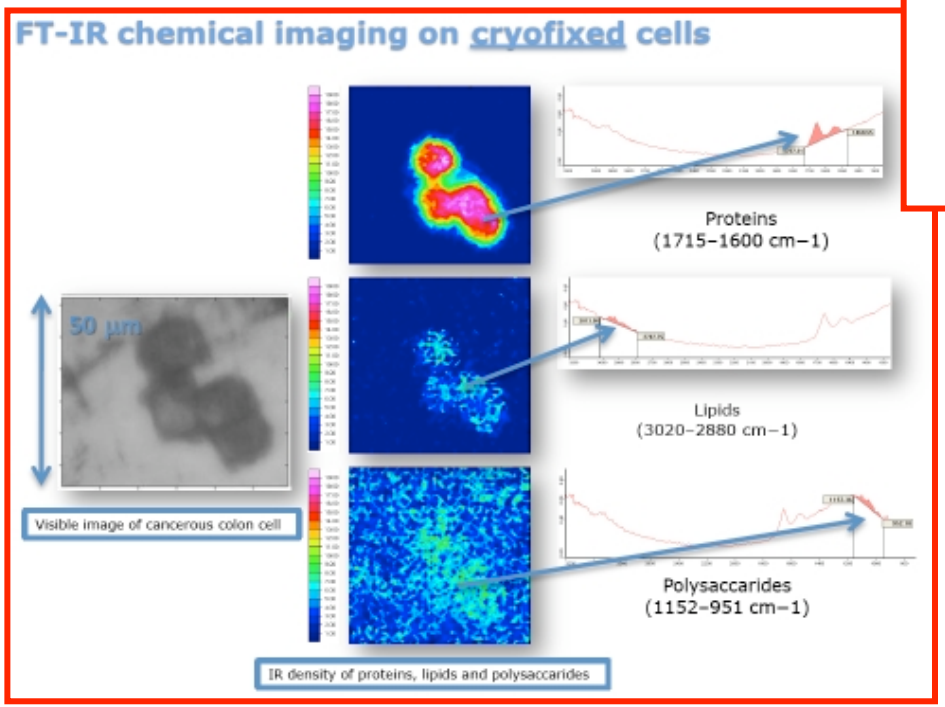
FTIR imaging on biological samples

FTIR imaging - ***comparison*** between the use of ***synchrotron radiation*** and of a ***conventional source.***

Synchrotron radiation FTIR imaging in minutes: a first step towards real-time cell imaging

C. Petibois, M. Cestelli-Guidi, M. Piccinini, M. Moenner, A. Marcelli Anal. Bioanal. Chem 397,2123 (2010)

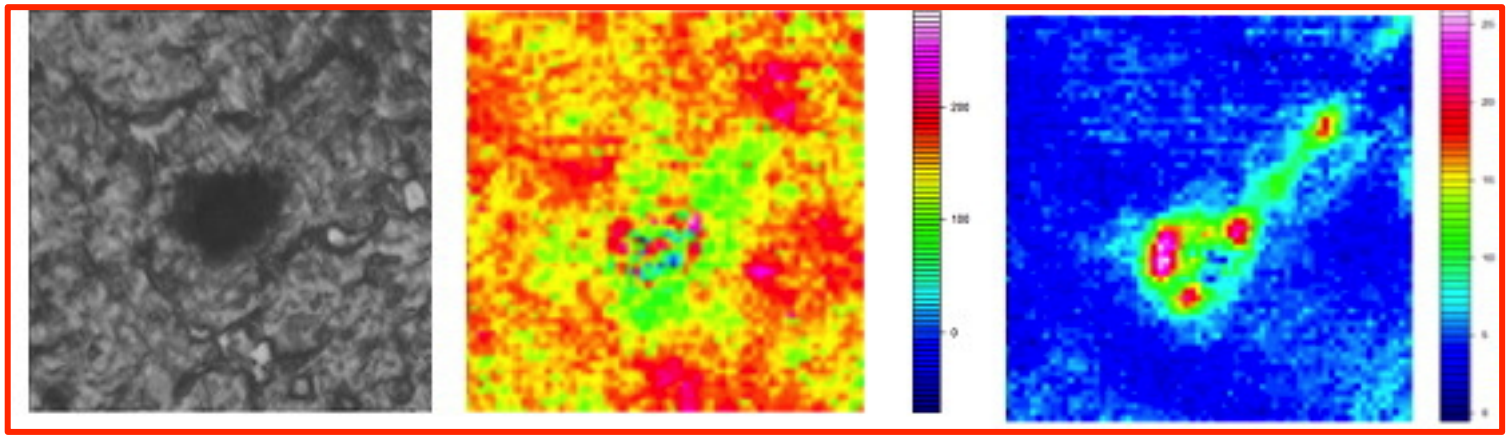




FTIR imaging -chemical mapping of the cells

Chemical analysis of brain tumor vasculature using inorganic nanoparticles as contrast agents
- University of Bordeaux

The very first results achieved using the IR source show that FTIR imaging can be used as a functional ***histopathology tool*** potentially interesting for further clinical applications. FTIR imaging has been performed on glioma (because malignant gliomas are the most common primary tumors of brain and spinal cord) vasculature using inorganic nanoparticles (NP) as contrast agents.



FTIR imaging of solid tumor perfused with PBS (Phosphate Buffered Solution) and Au-NP. **Left**: mice brain tumor tissue section (20 μm) with a large coopted blood vessel. **Center**: 2D-FTIR image of blood vessel (4000-900 cm^{-1} spectral interval). **Right**: 2D-FTIR image with **highest absorption contrast for Au-NP** vs. tissue using the 1150-950 cm-1 spectral interval.

Some SINBAD beamline 2010/2011 publications

Facing the challenge of biosample imaging by FTIR with a synchrotron radiation source. C. Petibois, M. Piccinini, M. Cestelli Guidi and A. Marcelli , ***J. Synch. Rad.*** **17**, 1 (2010)

Application of micro-FTIR imaging in the Earth sciences. G. Della Ventura, F. Bellatreccia, A. Marcelli, M. Cestelli Guidi, M. Piccinini, A. Cavallo, M. Piochi. ***Anal. Bioanal. Chem.*** **397**, 2039 (2010)

Synchrotron radiation FTIR imaging in minutes: a first step towards real-time cell imaging. C. Petibois, M. Cestelli-Guidi, M. Piccinini, M. Moenner , A. Marcelli. ***Anal. Bioanal. Chem*** **397**, 2123 (2010)

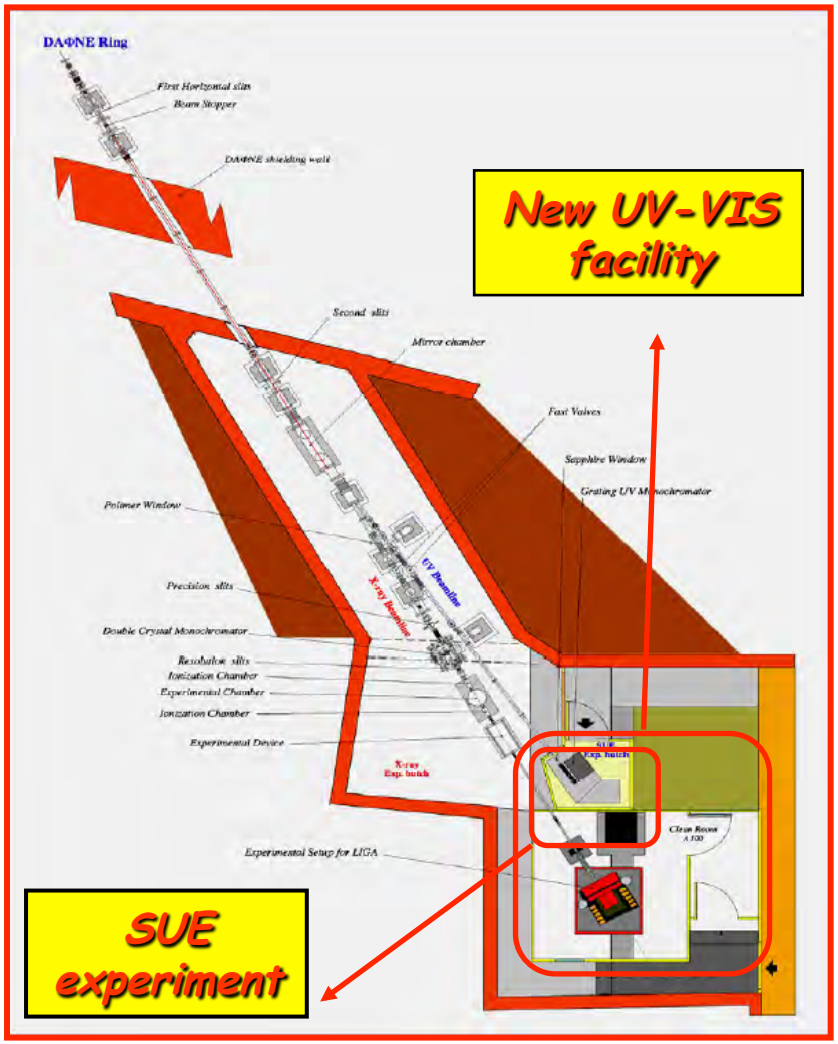
Experimental and ab initio study of vibrational modes of stressed alumina films formed by oxidation of aluminium alloys under different atmospheres. W.W. Peng, P. Roy, L. Favaro, E. Amzallag, J.B. Brubach, A. Congeduti, M. Cestelli Guidi, A.M. Huntz, J. Barros and R. Tétot, ***Acta Materialia*** **59**, 2723 (2011)

A crystallinity study of dental tissues and tartar by infrared spectroscopy. J. A. Abraham , H. J. Sánchez , C. A. Marcelli, M. Grenón, M. Cestelli Guidi, M. Piccinini. ***Anal. Bioanal. Chem*** **399**, 1699 (2011)

DXR2 UV branch line

Emanuele Pace

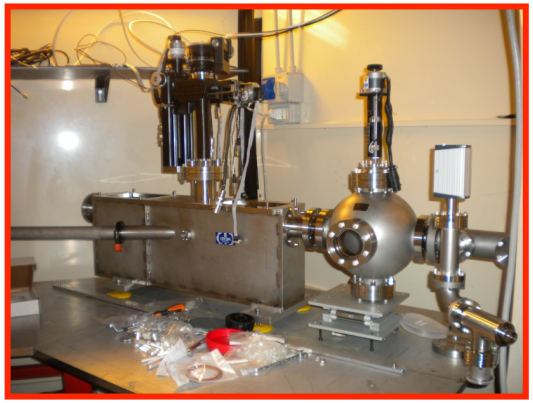
DAΦNE UV branch line: new setup



Wiggler UV branch line-deflection by a grazing incidence gold coated mirror (about 2 degrees)

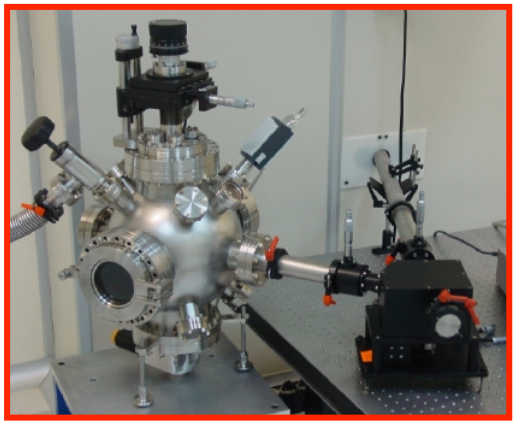
UV beamline new setup *2 -10 eV* (650nm - 120nm)

Branch line in a 1000-class *clean room*

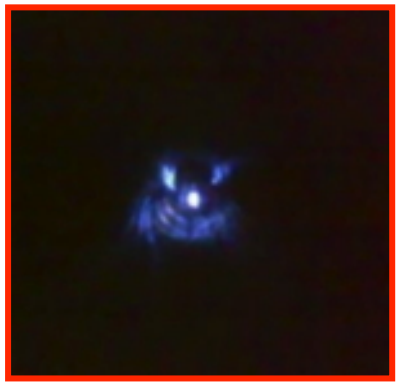


Upgraded UV-VIS monochromatic radiation source (180-650 nm)

VUV monochromatic radiation 120-250 nm



Nuovo setup: primo fascio focheggiato



7 febbraio 2011

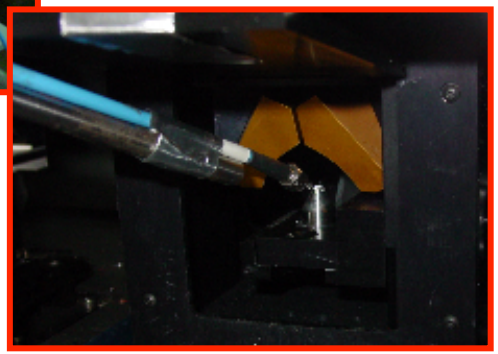
Prima luce del nuovo sistema ottico sulla linea UV-VIS.

Lo spot è di 1 mm di diametro come previsto dalle simulazioni.

Gli aloni di luce sono luce riflessa dalle pareti della linea per un allineamento del sistema ottico non ottimizzato.

… prime misure

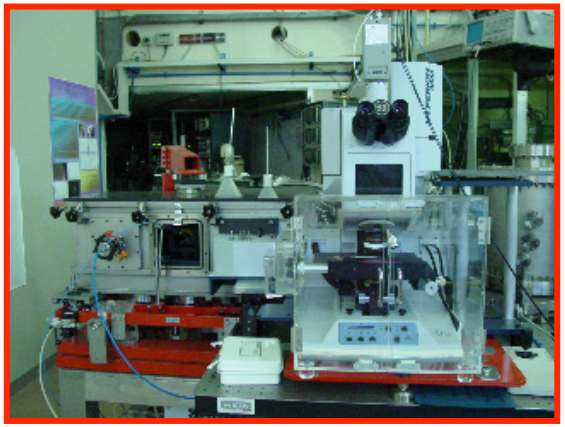
Sorgente UV e ***fibra ottica*** per il trasporto della radiazione sul campione.



Misure di ***irraggiamento UV*** e ***analisi FTIR*** in tempo reale di materiali organici di interesse astrobiologico per valutare l' evoluzione del danno radiativo.

Uso combinato di due linee di luce

IR setup sperimentale



ACTIVITY 2010-2011-2012

- ***Commissioning delle 3 diverse uscite*** [(280-320) nm -(120-250) nm - (180-650 nm)] con le lampade convenzionali e con ***la radiazione di sincrotrone*** (dipendente dalla disponibilità di fasci di luce)
- ***Completamento del software di controllo della linea*** **(richiesta di tempo al Servizio elettronica e automazione)**
- **Apertura della linea a richieste di utenti tra cui:**
- ***Misure su materiali organici e inorganici per il progetto PRIN2008*** *"Materiale extra-terrestre primitivo come memoria dei processi evolutivi nel Sistema Solare primordiale"*
- ***Irraggiamenti di materiali organici in presenza di catalizzatori inorganici*** (Saladino et al., Univ. Tuscia di Viterbo) per studiare la formazione di molecole complesse nell' ambiente spaziale.
- **Misure di ageing UV di materiali innovativi a memoria di forma (FOAM).**
- **Test di rivelatori di radiazione UV basati su diamante** per caratterizzare la risposta a impulsi ultra corti (2.7 ns) e la risoluzione temporale.

Partnership

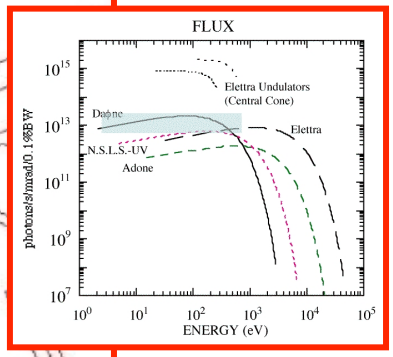
- ***INFN – LNF***
- ***INFN – Firenze***
- ***Università di Firenze- Antonio De Sio***
- ***CNR – Istituto Nazionale Ottica Applicata (INOA)***
  Lisa Gambicorti

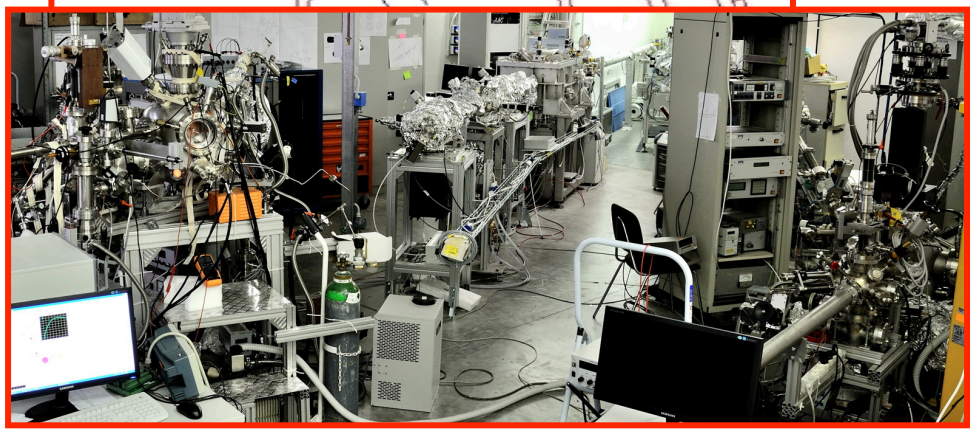
New XUV beamlines

Roberto Cimino

New XUV beamlines

LEB (35-200 eV) commissioning in 2011
HEB (60-1000 eV) commissioning by the end of 2011





Fields of interest:

Biology

Surface Science

Material Science

R&D studies of INFN interest

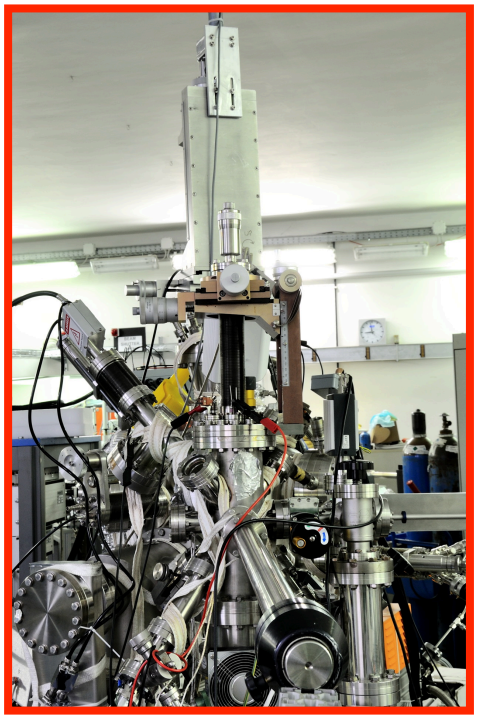
IMCA-NTA INFN project:
Innovative **M**aterials and
Coatings for **A**ccelerators

R&D of new materials and thin films useful to minimize beam instabilities due to '**e-cloud**.

Material science and tests of relevance for e-cloud studies in collaborations with **CERN, DESY (PETRA 3), Brookhaven (RICH)** etc.

Status of the XUV LEB (35-200 eV)

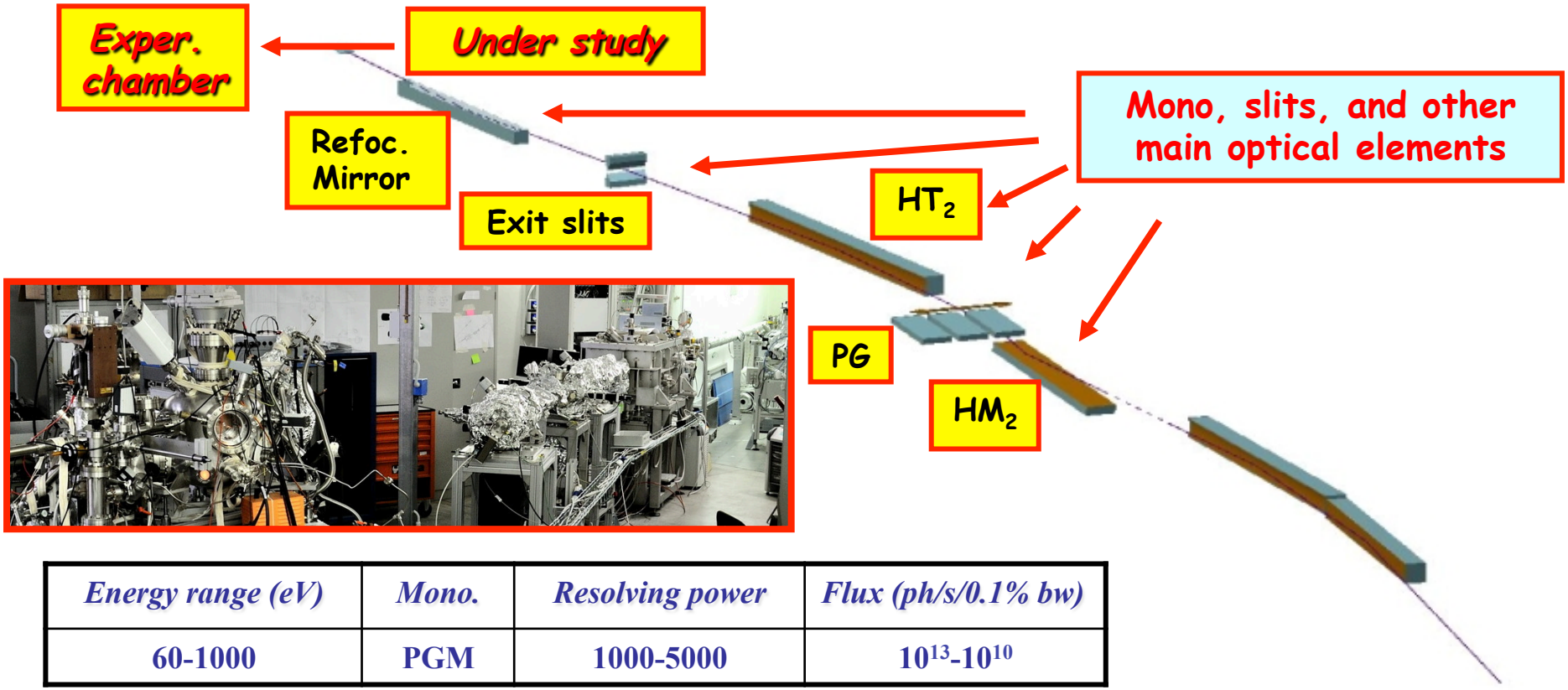
All the ***optical and vacuum components*** of the ***LEB*** beamline did become ***available during 2008-2009***, and the DAΦNE-L team worked to mount them in the foreseen position.



The 2010 has been also devoted to the optimization of a 'state of the art' ***spectroscopic chamber***, in order to be able to do ***angle resolved photoemission experiments, also at low temperature***. This system has been ***tested*** at length during this year and ***a fast load-lock system has been implemented*** in order to be able to change samples to be studied with SR without breaking vacuum.

LEB - R. Cimino, R. Flammini (CNR)

Status of the XUV HEB (60-1000 eV)



Energy range (eV)	*Mono.*	*Resolving power*	*Flux (ph/s/0.1% bw)*
60-1000	PGM	1000-5000	10^{13}-10^{10}

The optical elements and UHV vacuum chambers needed for the construction of the ***HEB*** have been ordered. Some were delivered in 2009, some (like the ***PGM monochromator***) are still under construction and will be delivered by the end of 2010. Also for this beamline an ***experimental set-up to perform SR photoemission and absorption spectroscopy in UHV condition*** is under study. The setup will be ready within next year thanks to the active ***collaboration with R. Larciprete (C.N.R.)*** both for human resources and goods.

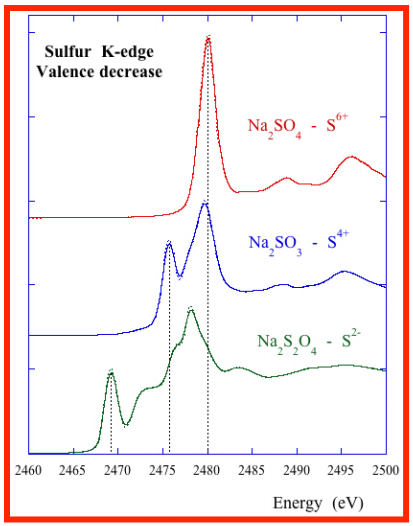
HEB - R. Cimino, R. Larciprete (CNR) , D.R. Grosso (Fellow 2011)

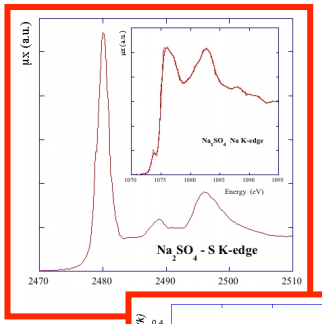
DXR1 Soft X-ray Beamline

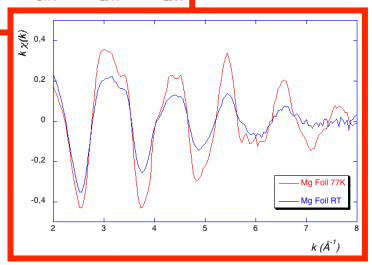
Antonella Balerna

DXR1 Soft X-ray Beamline

- Wiggler soft x-ray beam line
- Critical energy E_c = 284 eV
- Working range ***0.9 - 3.0 keV***
- The ***monochromatic photon flux*** as a function of photon energy, monochromator crystals used and DAΦNE current is between ***10^7*** and ***10^9 ph/s.***

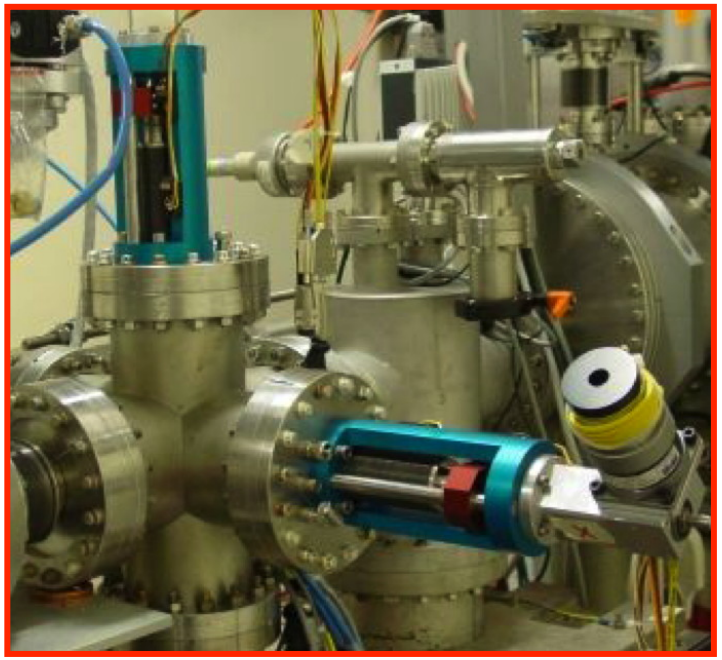




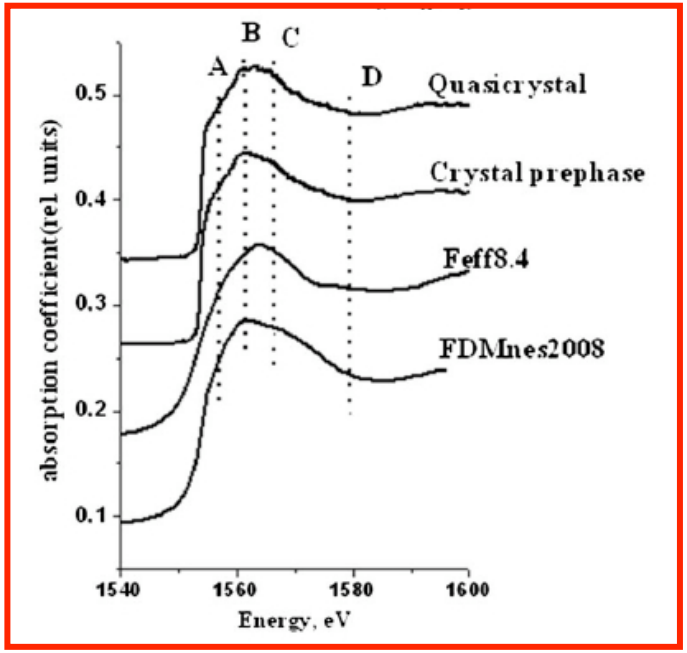


During **2010** some tests were performed on the ***double wire beam monitor*** and a small change including an ***horizontal slit*** was realized and mounted. A new system to ***control, set and include in the experimental files the values of the pressures of the ionization chambers*** has been installed and tested and only small changes in the acquisition program were performed.

Beamline re-alignment.



DXR1 Soft X-ray Beamline



Quasicrystals (quasiperiodic crystals) are attracting intense interest due to their unique properties being non-typical for their crystalline and amorphous phase analogues. Changes of the local structure around Al, Cu, Fe atoms from the quasicrystalline to the crystalline phase transition have been studied. Investigation of the local atomic structure of the $Al_{65}Cu_{22}Fe_{13}$ quasicrystal and its crystal analogue has been performed on the basis of the ***XANES analysis that permits to determine the 3D local atomic structure*** of the given materials. Theoretical analysis of the experimental data has been carried out on the basis of a self- consistent, real space multiple scattering method (FEFF8.4 code) and a finite difference method (FDMNES2009 code).

M.A Evsyukova, G. Yaloga, A. Balerna, A.P. Menushenkov, Ya V. Rakshun, A.A. Teplov, M.N. Mikheeva and A. V. Soldatov, Crystal-quasicrystal transition in the Al-Cu-Fe system: Analysis of the local atomic structure.***Physica B*** **405**, 2122 (2010)

R. Sathyamoorthy, P. Sudhagar, A. Balerna, C. Balasubramanian, S. Bellucci, A.I. Popov and K. Asokan, Surfactant-assisted synthesis of Cd(1-x)Co(x)S nanocluster alloys and their structural, optical and magnetic properties.***Journal of Alloys and Compounds*** **493**, 240 (2010)

W. M. Kwiatek, J. Czapla, M. Podgórczyk, A. Kisiel, J. Konior, A. Balerna, *'First approach to studies of sulphur electron DOS in prostate cancer cell lines and tissues studied by XANES'* To be pub. on ***Radiation Chemistry and Physics (2011)***. doi:10.1016/j.radphyschem.2011.05.005

More information about the DAΦNE- Light facility

http://www.lnf.infn.it/dafnel

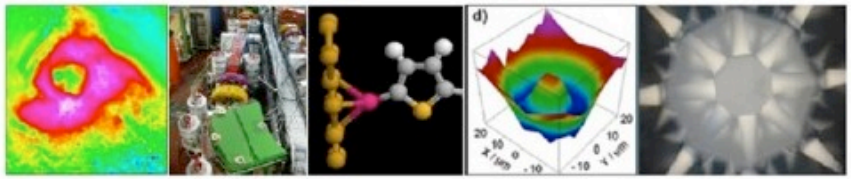
DAFNE-LIGHT

INFN-LNF Synchrotron Radiation Facility

INFN | LNF | DAFNE Storage Ring | DAFNE-Light

Menu

- Home
- Beamlines
- Organization
- Secretariat
- Technical Staff
- General publications
- Highlights
- DAFNE storage ring parameters
- DAFNE status
- How to apply



DAFNE-Light

DAFNE-Light is the Synchrotron Radiation Facility at the Laboratori Nazionali di Frascati (LNF).

Three beamlines are operational using, in parasitic and dedicated mode, the intense photon emission of DAFNE, a 0.51 GeV storage ring with a routinely circulating electron current higher than 1 Ampere. Two of these beamlines (DXR1 and DXR2) have one of the DAFNE wiggler magnets as synchrotron radiation source, while the third beamline (SINBAD-IR) collects the radiation from a bending magnet. New XUV bending magnet beamlines are nowadays under construction.

The beamlines DXR1 and SINBAD-IR are open to external users.

Login

Username

Password

Remember Me

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- Forgot your password?
- Forgot your username?
- Create an account

Who is online

We have 1 guest online

Thank you for your attention