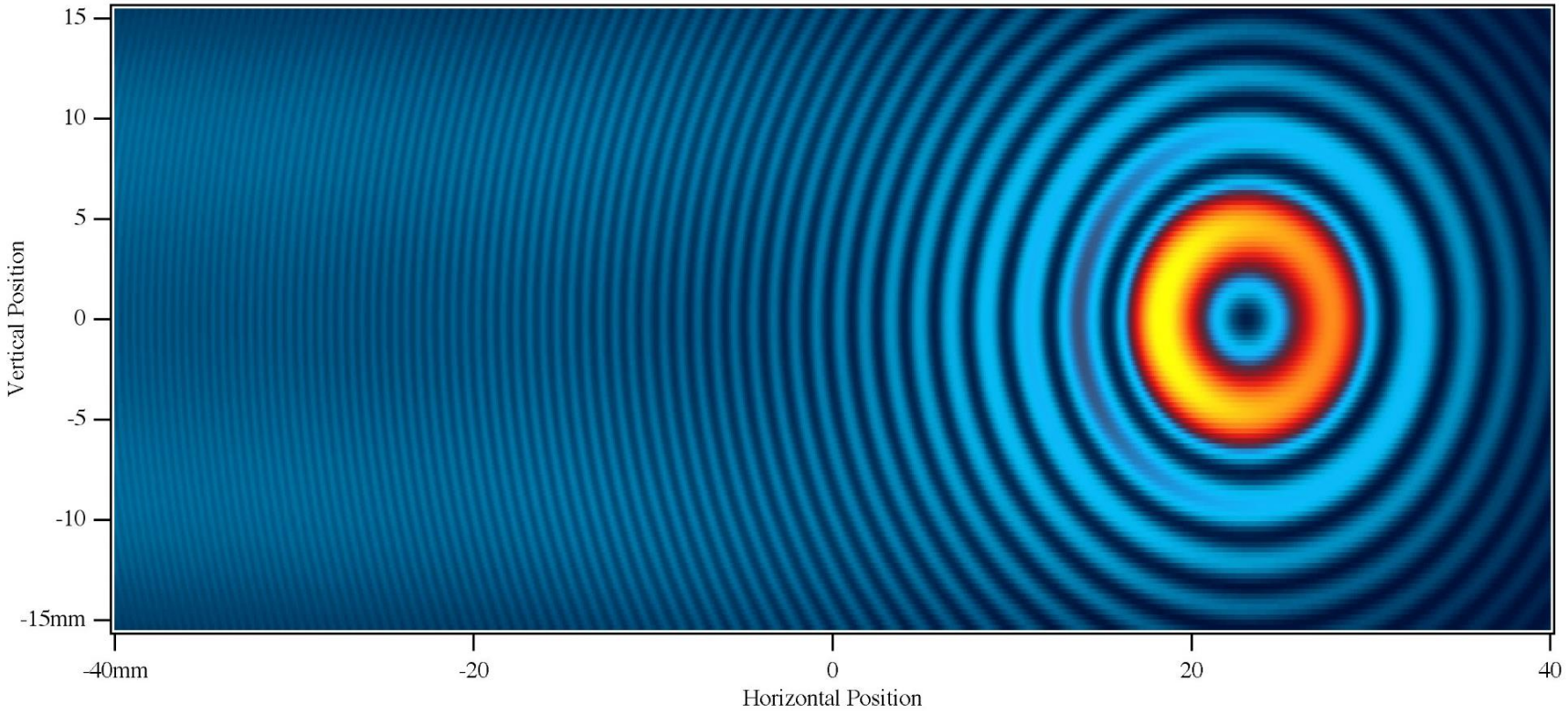
SESAME Infrared Beamline: Briefly!



Gihan kamel

IR-beamline Scientist

On Leave from: Department of Physics, Faculty of Science, Helwan University, Cairo , Egypt

3 Reverse the brain-drain in the region

University of Rome, Italy

LNF-INFN, Italy

Opportunity

Helwan University, Egypt

SESAME, Jordan

A few things to remember..!

- *Not operational (yet) but working..*
- *Similar but different..*
- *Weakness and strength..*
- *Black and White but there is also pink..*
- *Challenges more than problems..*
- *Not the (wow) but competing..*
- *A dream but not a fantasy..*

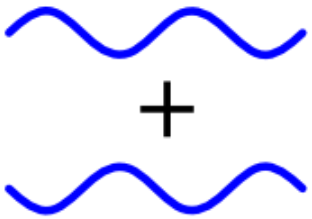
UNIQUE

You may say I'm a dreamer, but I'm not the only one!

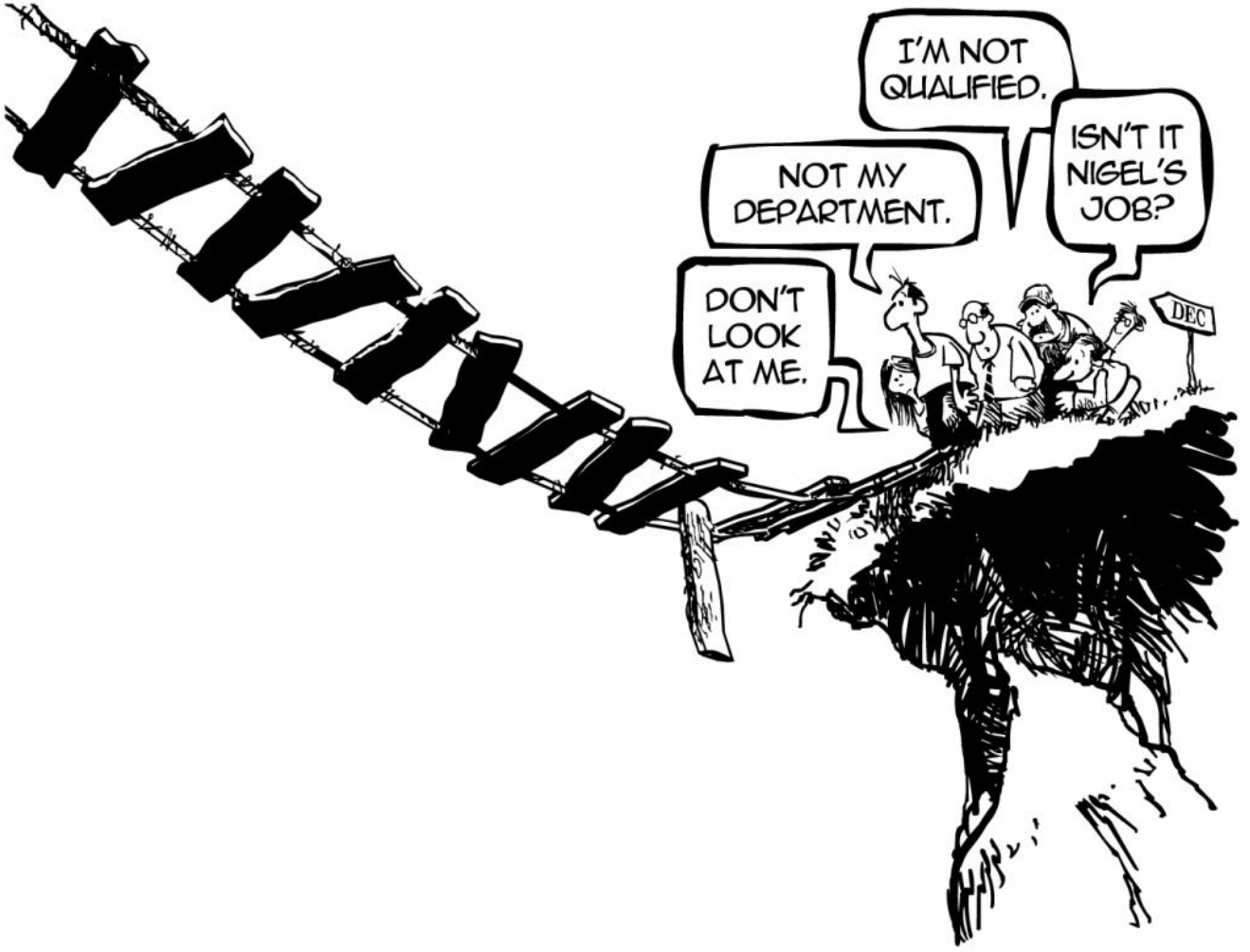
SESAME 13th Users' Meeting, Jordan, 26-27 November 2015

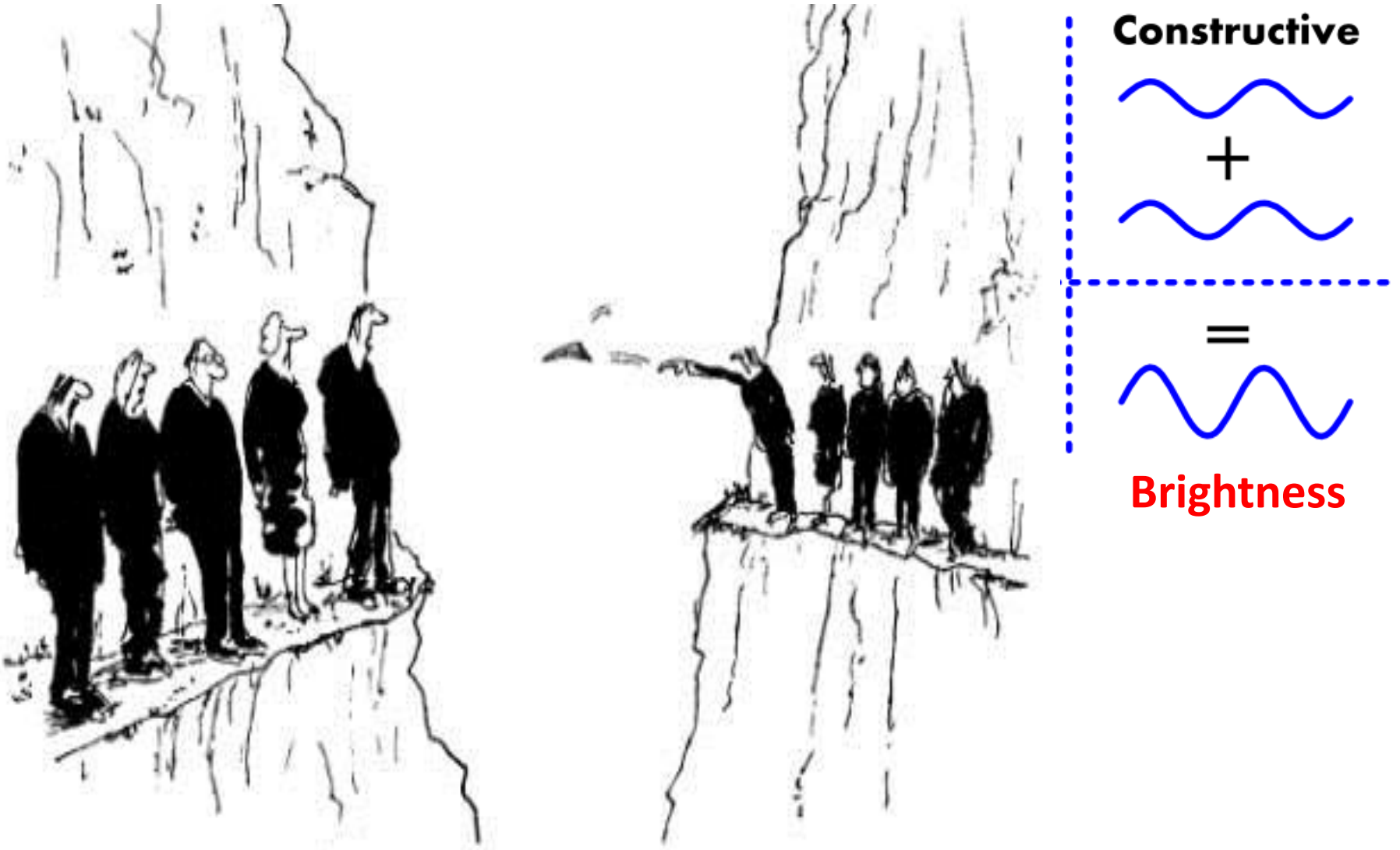
INTERFERENCE

Destructive



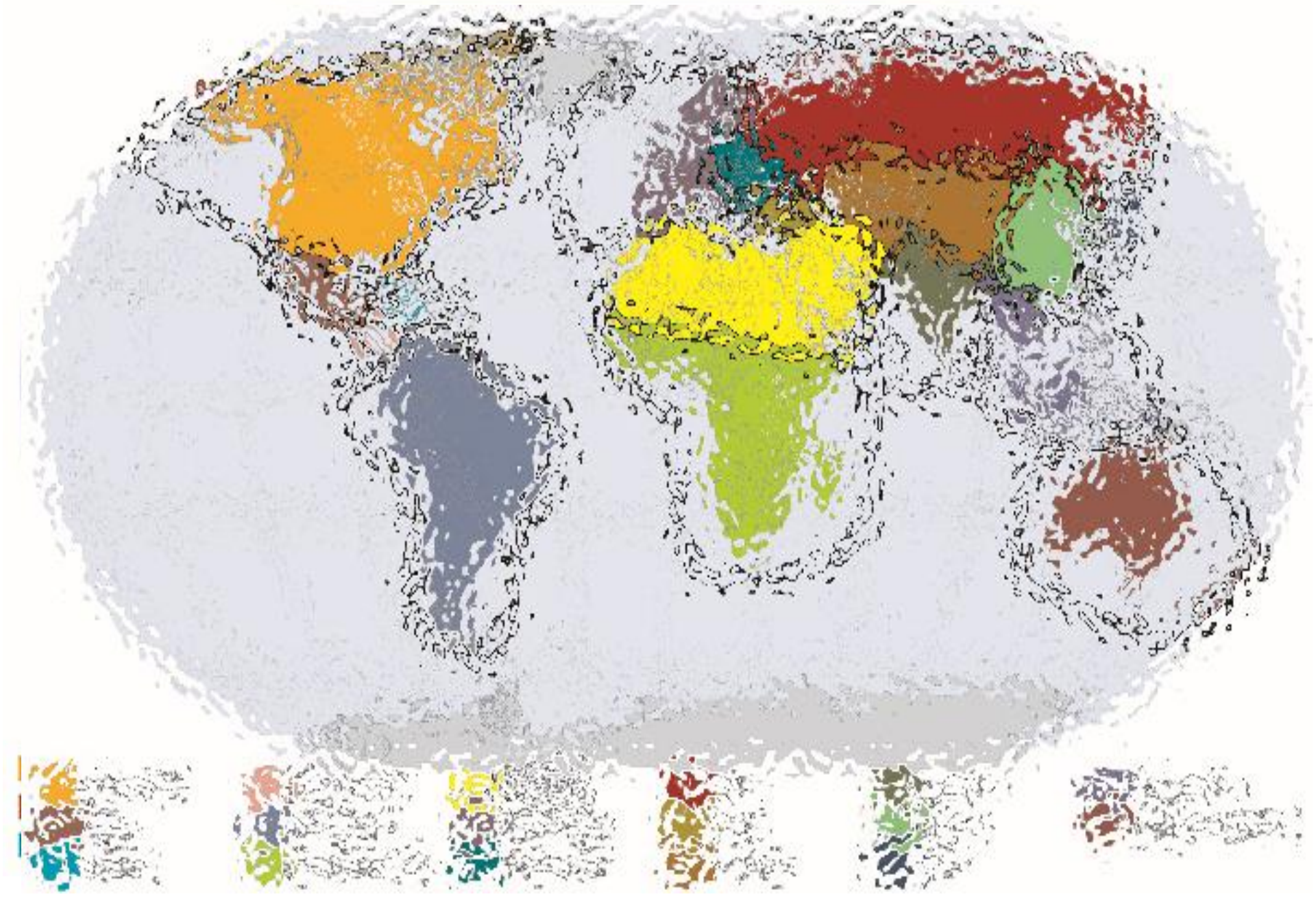
Darkness

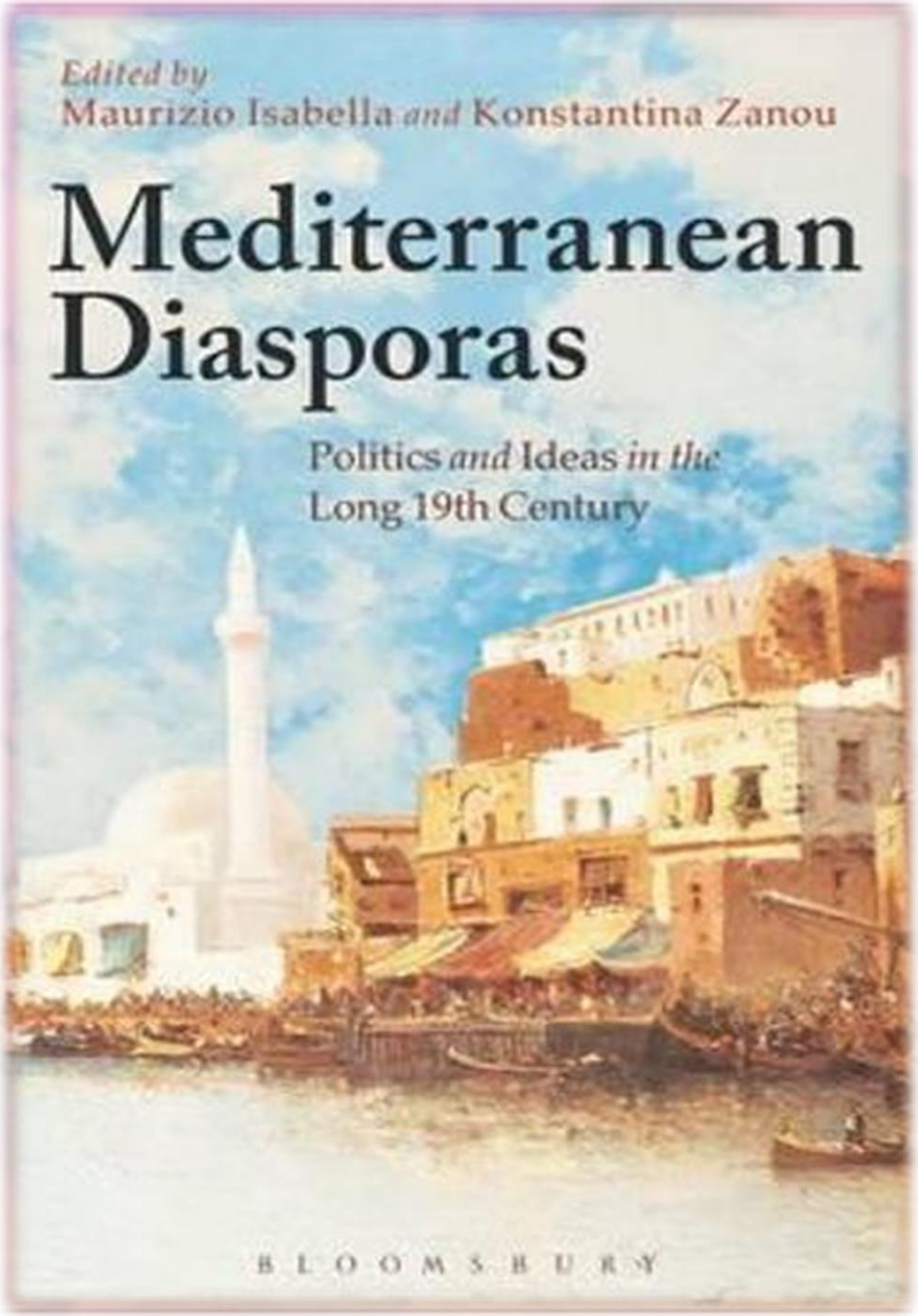




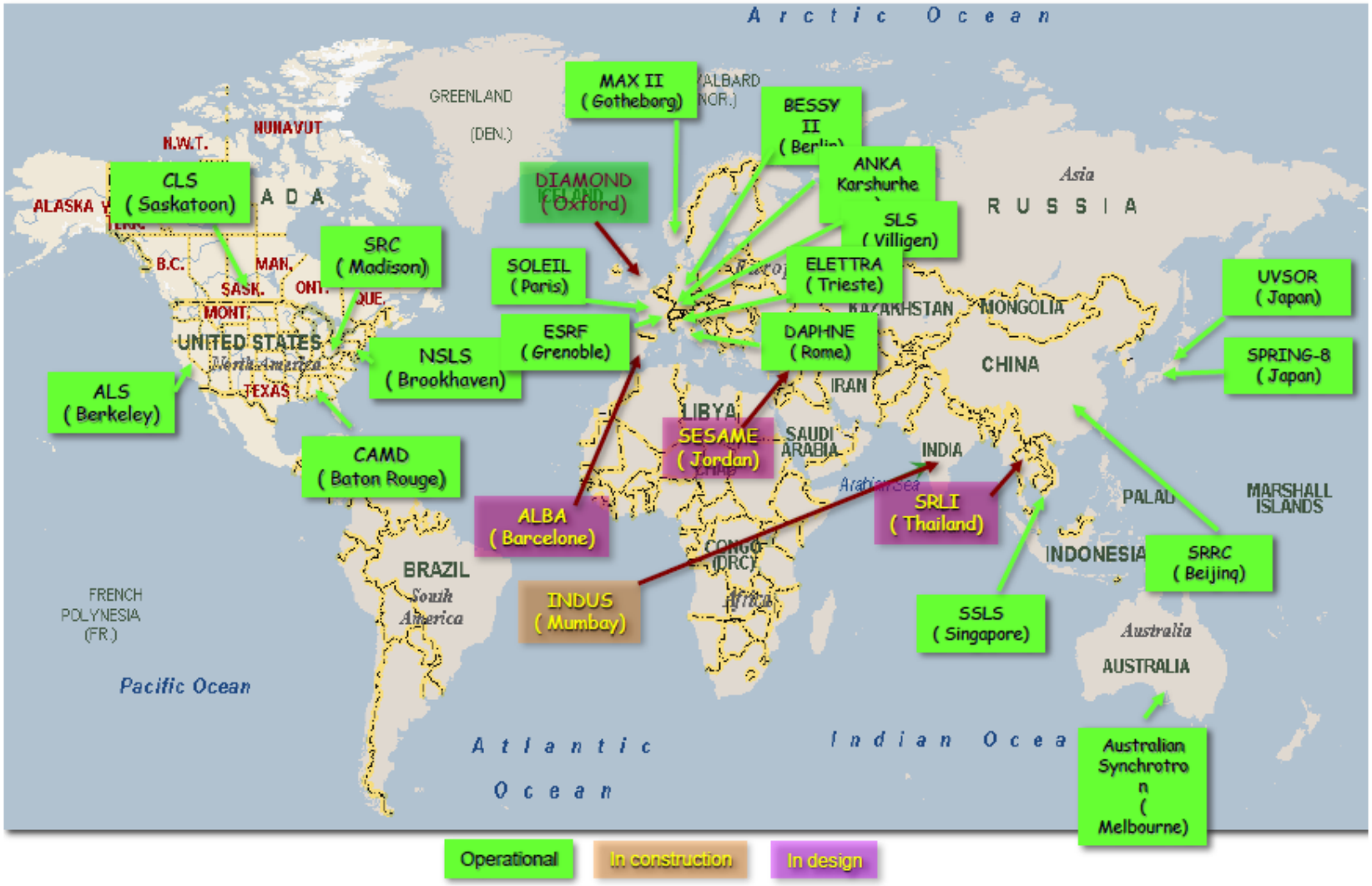
Science= common language + common values + mutual benefits

Map of the world as IT SHOULD BE seen by Scientists




Edited by
Maurizio Isabella and Konstantina Zanou
Mediterranean Diasporas
Politics and Ideas in the Long 19th Century
BLOOMSBURY

Infrared Beamlines in the world

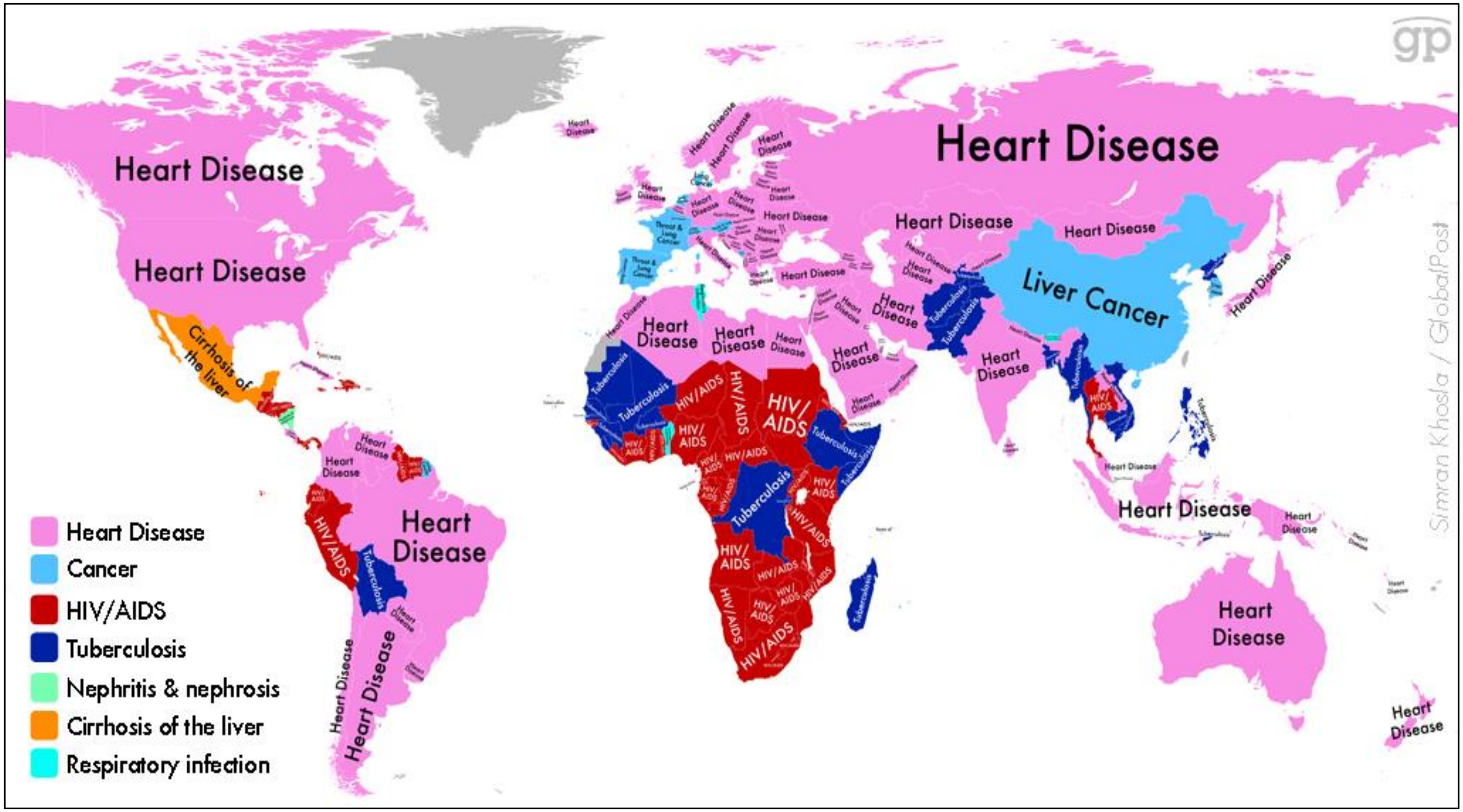


Is it of similar interest to the Middle-East Scientific Community?

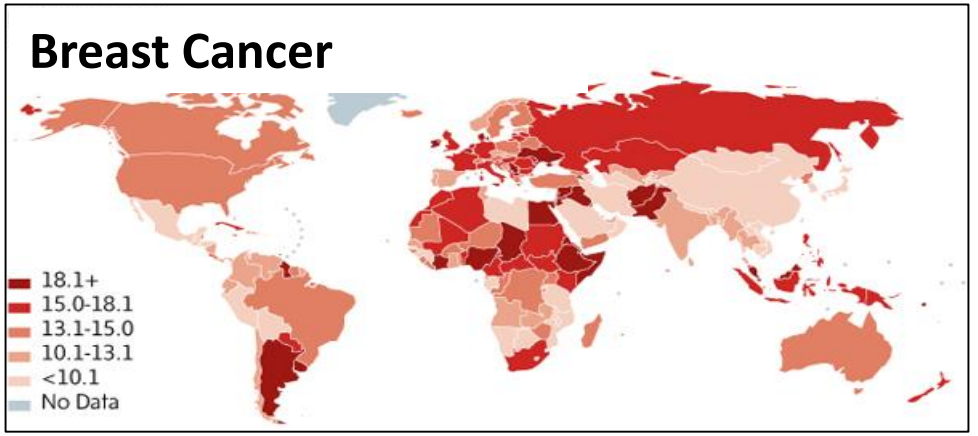
Middle-East, *et al*.

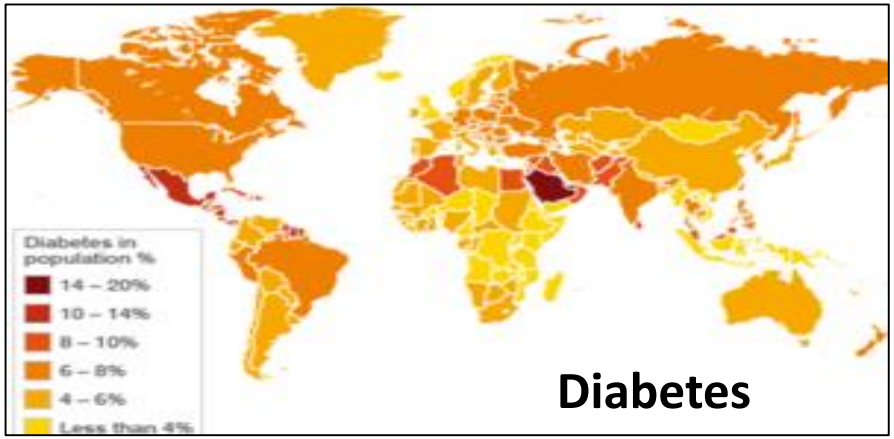
- Diseases are deeply connected to ***geographical environments***..

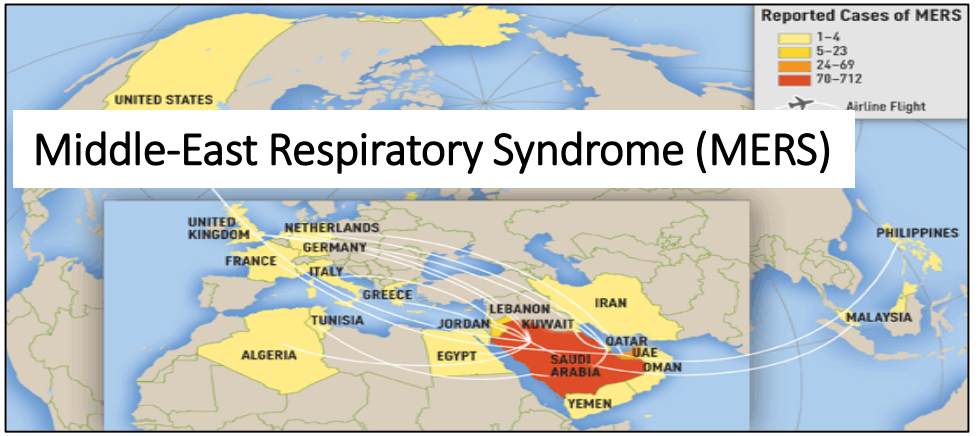
Leading: cardiovascular, cancer, chronic respiratory diseases, and diabetes..

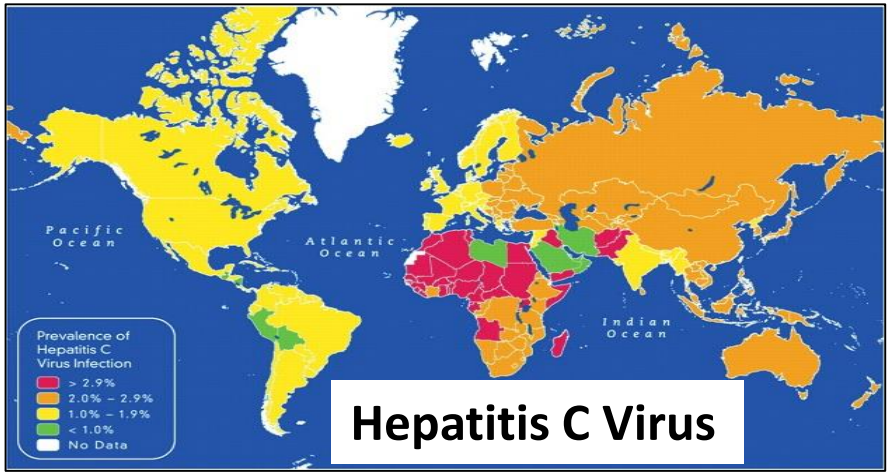


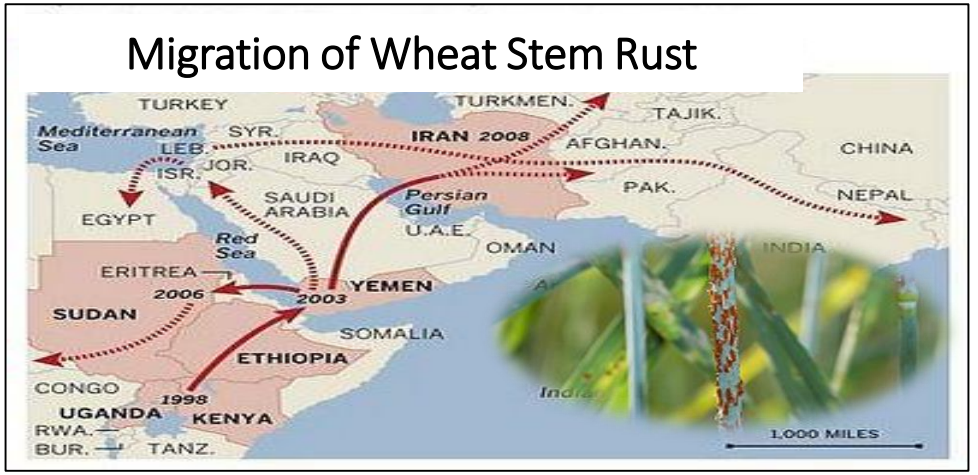
Some targets?











1 Foster science and technology in the ME region

DAY-1 Beamline

IR beamline @ SESAME:

The FIRST fully designed,
in collaboration with SOLEIL Synchrotron, France

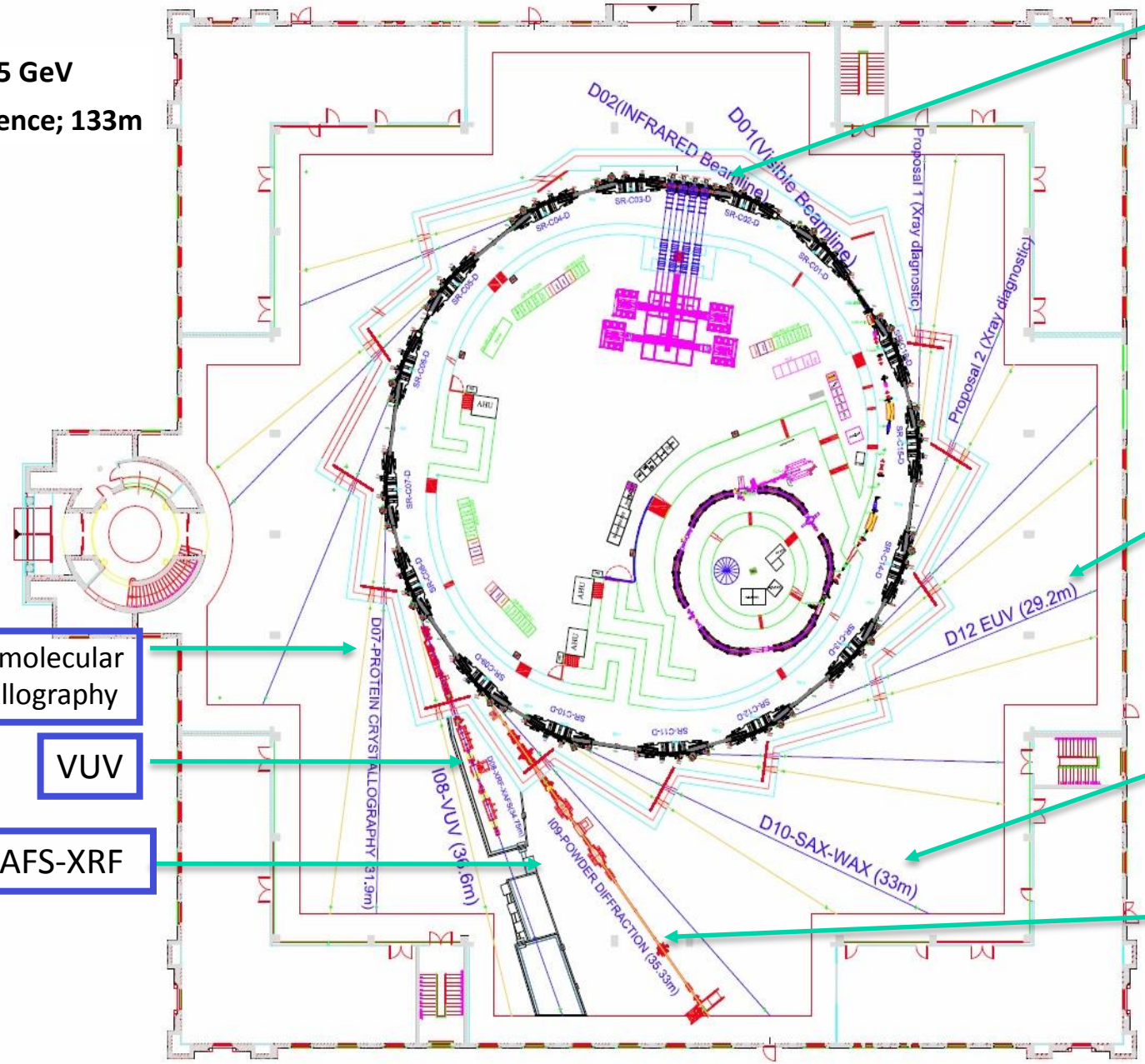
"In the context of beamline selection and approval within the portfolio of the potential end stations, as expressed by various letters of interest generated by diverse communities.."

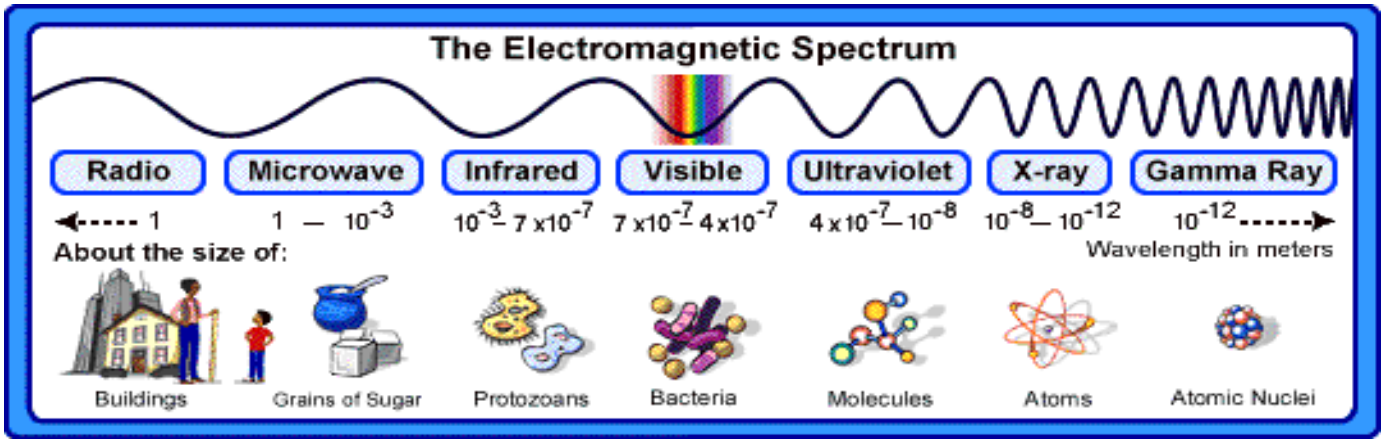
Purpose: *Addressing the present and the future requirements of the scientific community in the Middle East.*

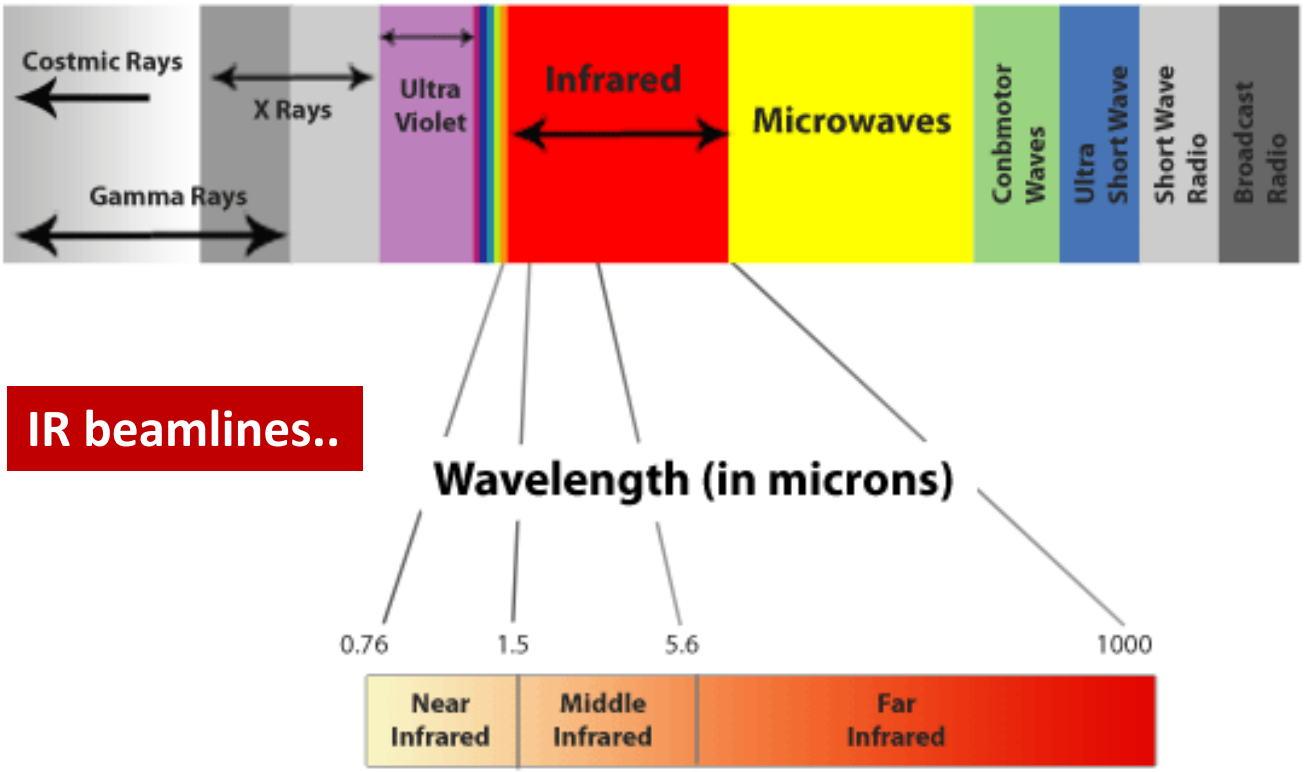
Phase 1 Beamlines

Energy; 2.5 GeV

Circumference; 133m

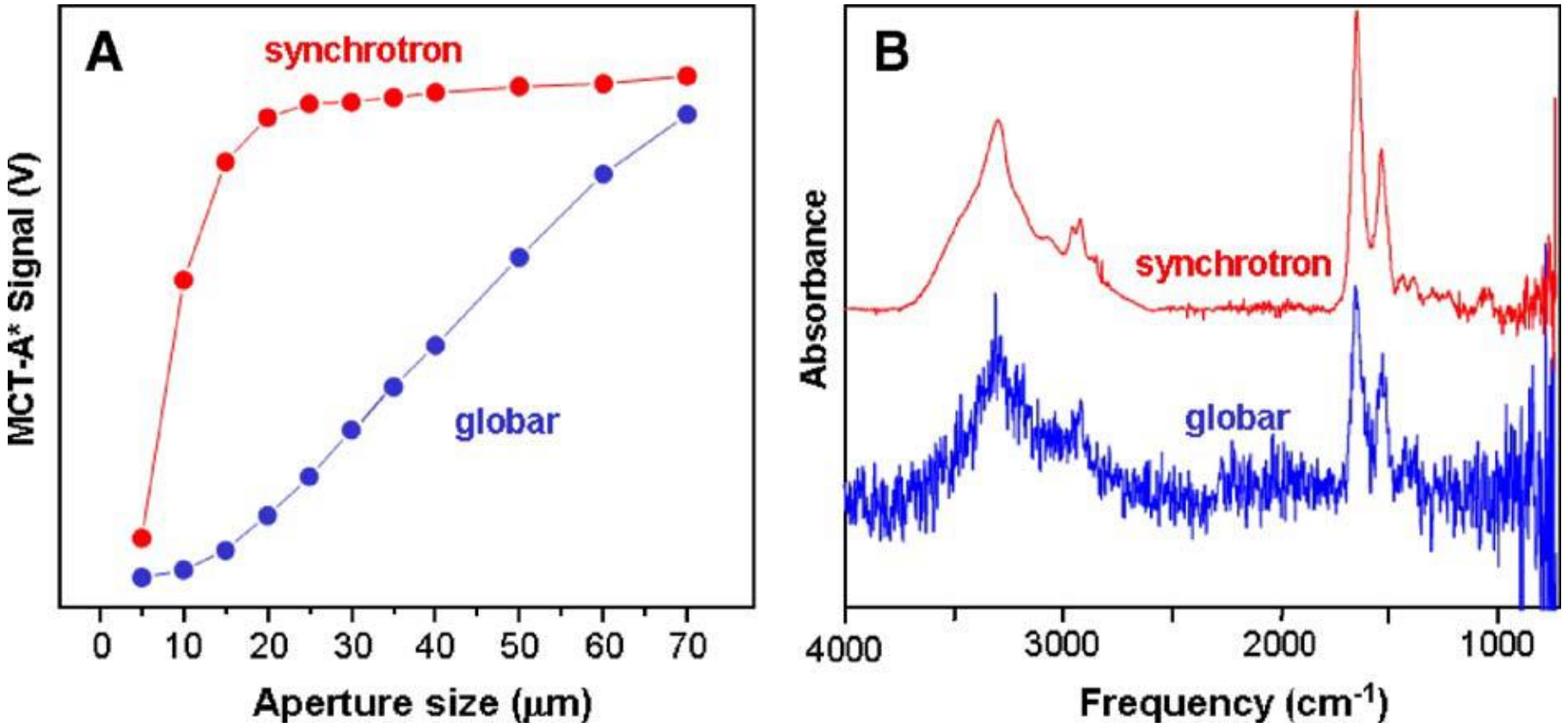






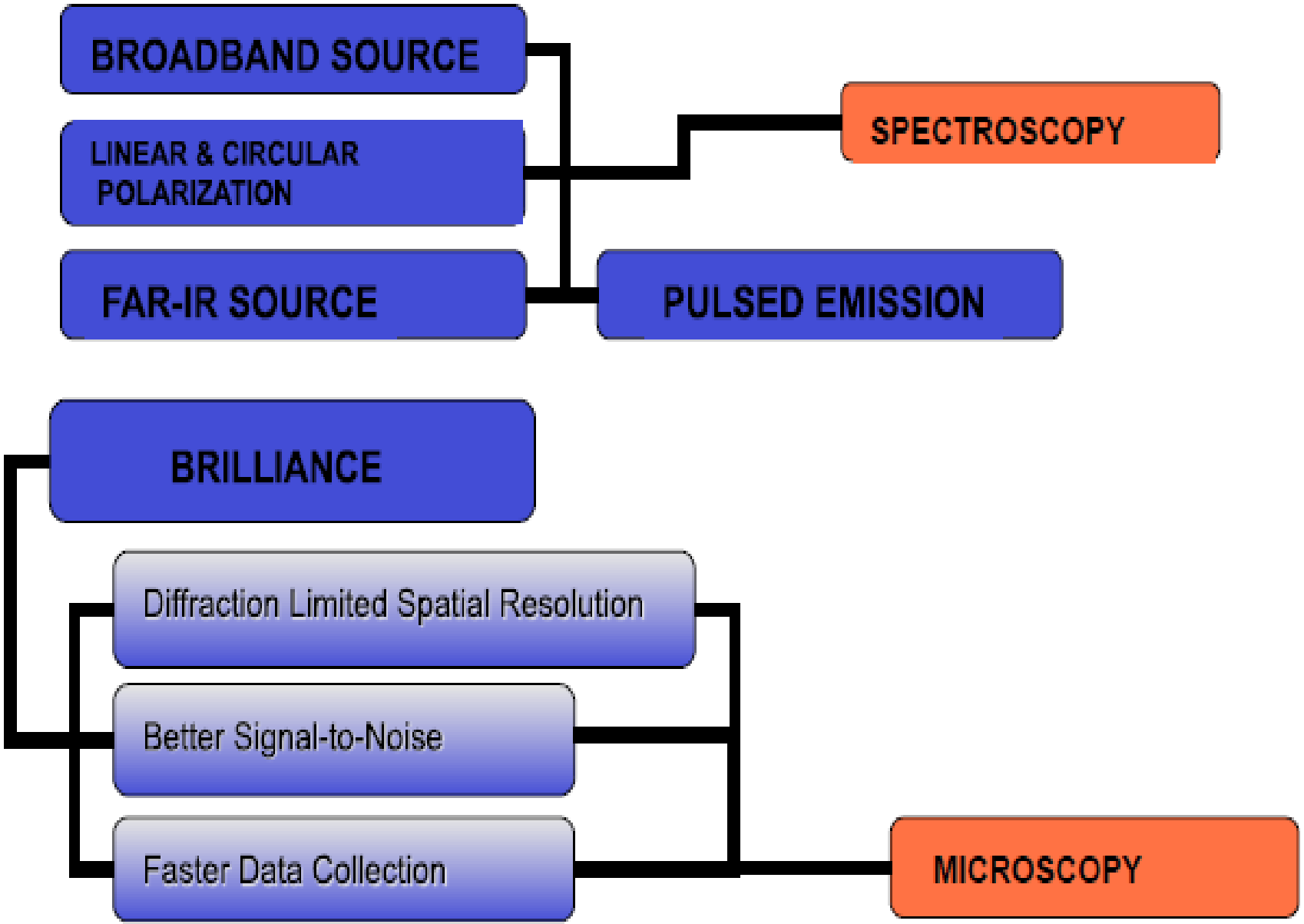
IR beamlines..

Why Synchrotron?



Infrared signal through various aperture sizes using a synchrotron versus globar source. A confocal IR microscope was used with a single-point detector. (B) Infrared spectra of a single red blood cell collected with a synchrotron versus globar source. A square aperture of 5×5 µm was used.

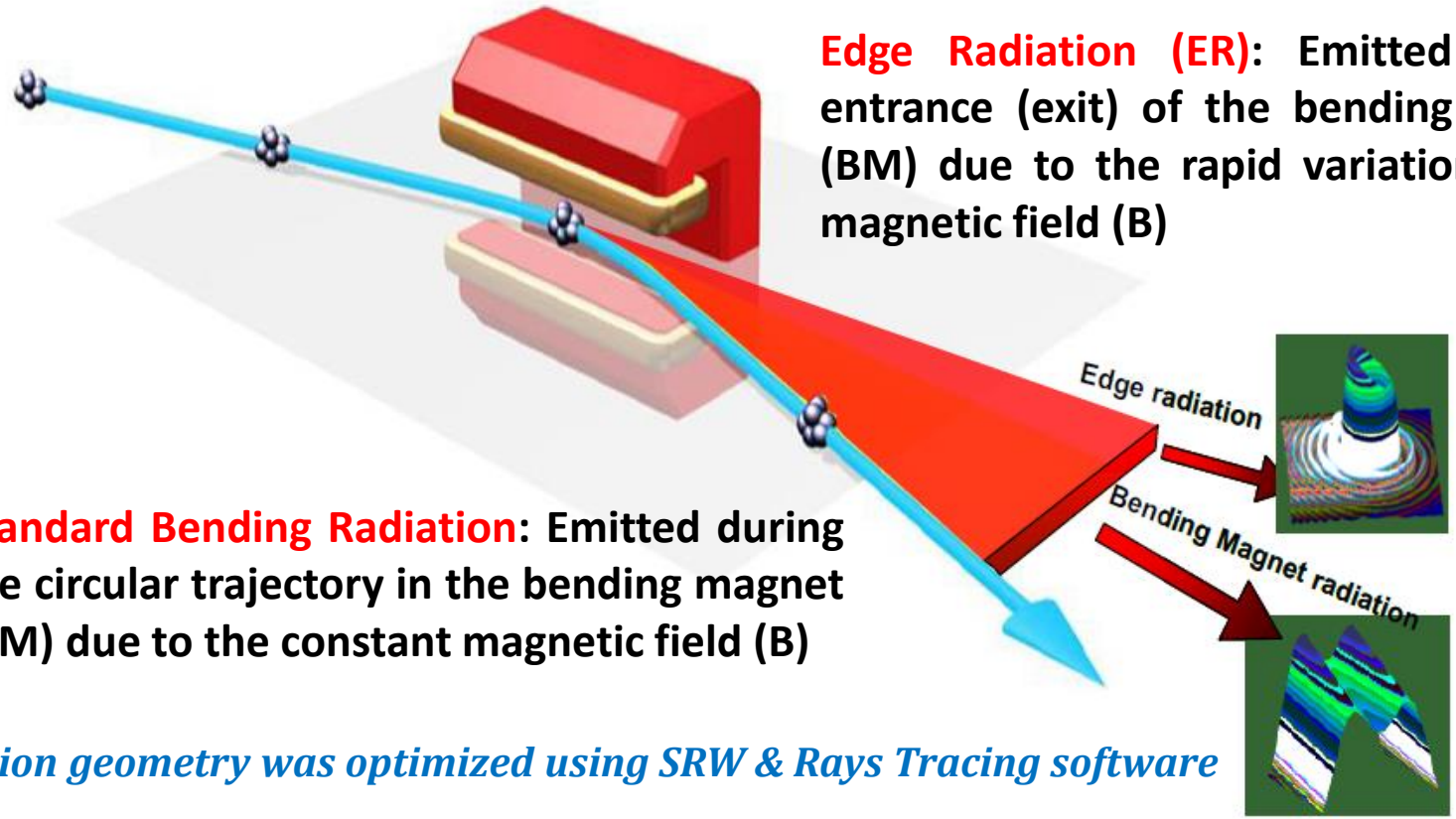
L.M. Miller, P. Dumas / Biochimica et Biophysica Acta 1758 (2006) 846–857


BROADBAND SOURCE
LINEAR & CIRCULAR POLARIZATION
FAR-IR SOURCE
SPECTROSCOPY
PULSED EMISSION
BRILLIANCE
Diffraction Limited Spatial Resolution
Better Signal-to-Noise
Faster Data Collection
MICROSCOPY

SR-IR Emission Sources..

Parameter	Description	Value
E	Electron energy	2.5 GeV
B	Magnetic field	1.4554 T
R	Bending radius	5.726 m
I	Electron current	400 mA
L	Straight section length	4.4 m

Vertical collection angle = 15 mrad
Horizontal collection angle = 39 mrad



Edge Radiation (ER): Emitted at the entrance (exit) of the bending magnet (BM) due to the rapid variation of the magnetic field (B)

Standard Bending Radiation: Emitted during the circular trajectory in the bending magnet (BM) due to the constant magnetic field (B)

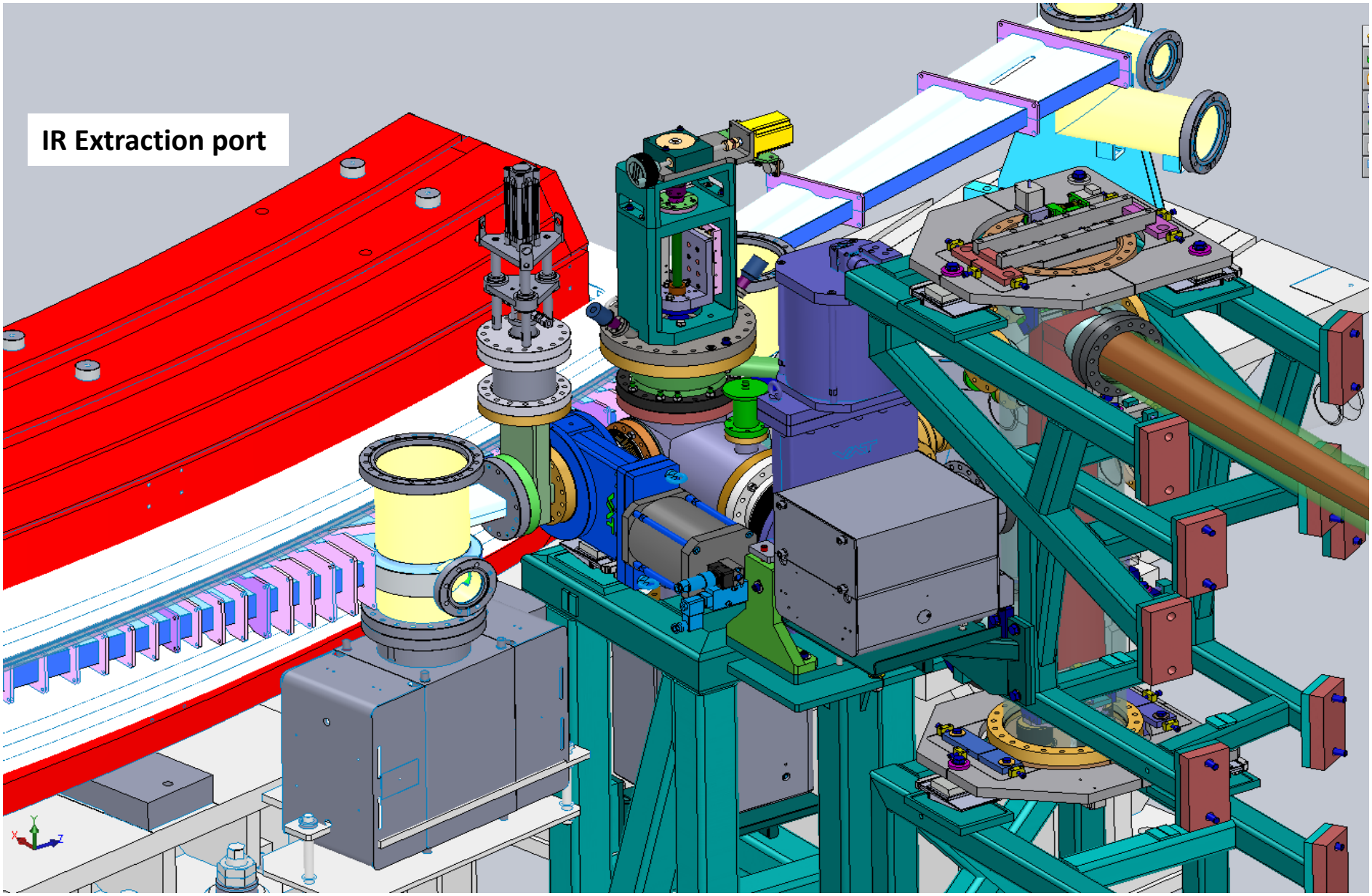
Collection geometry was optimized using SRW & Rays Tracing software

Operational beamlines exploits both sources of radiation (SOLEIL, Australian Synchrotron, DIAMOND, NSRC, ALBA, ANKA)

Beamline features:

Energy Range	Between ~1.5 Åμm and 50 Åμm, 10-25,000 cm-1 (1 meV-3eV)
Space Resolution	Diffraction limited
Energy Resolution	0.2 cm^{-1} - 0.012meV
Source	Emission from the two main sources of radiation, edge and constant field of the bending m with opening angle of 38 mrad horizontal and 15 mrad vertical.
Flux @ first optical element	6.93607e+13 Ph/s/0.1%bw @ 10 Åμm for 400 mA stored current
Sample Environment	An IR microscopy set-up consists of a microscope coupled to a FTIR spectrometer, Simultar fluorescence measurements will be available, Infrared windows for sample handling.
Configuration	Transmission, Reflection, ATR
Beam size at sample	size of the aperture from ~ 3x3 Åμm2 , to ~ 100x100 Åμm2

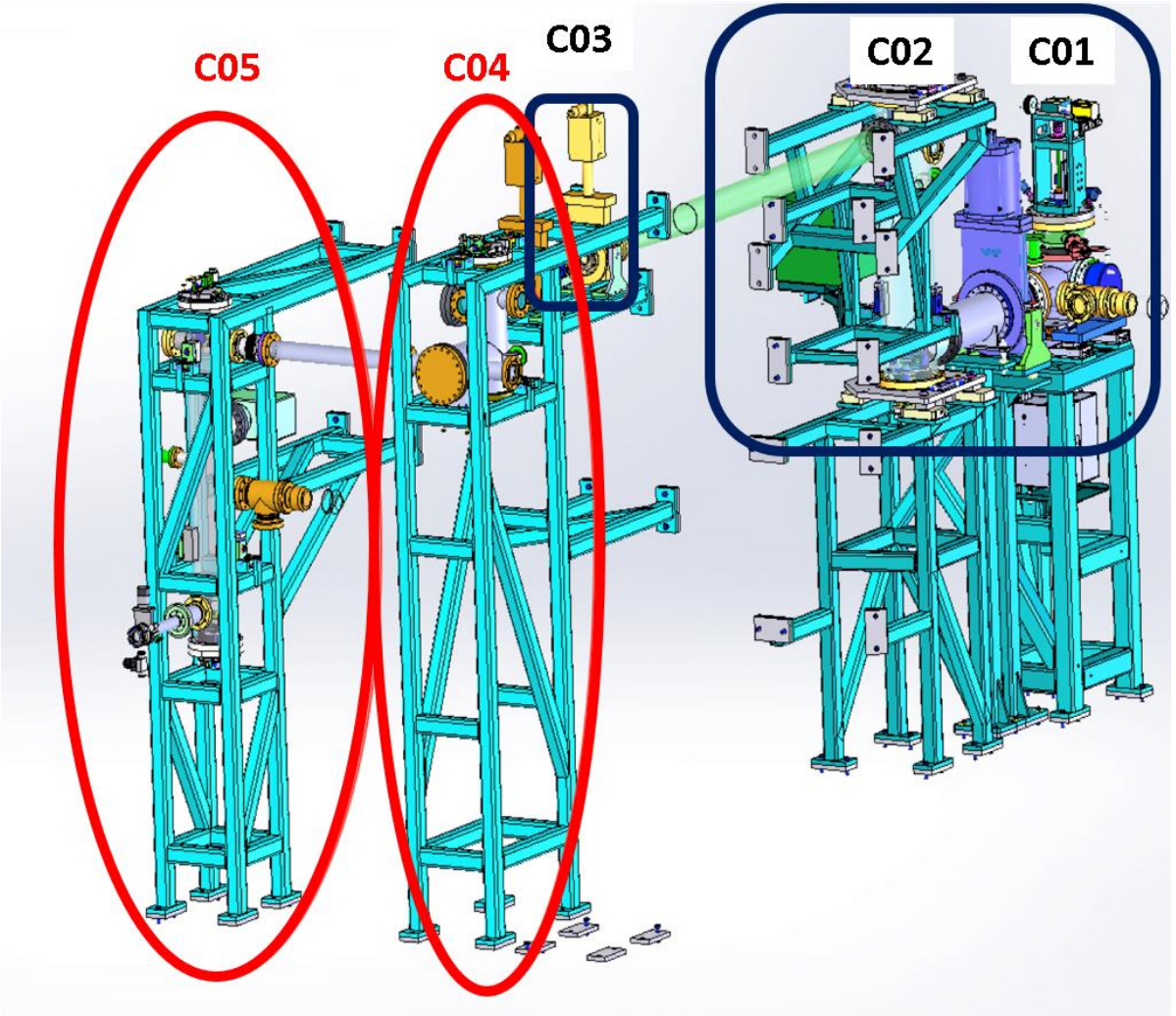
Implementation of the Infrared Beamline compatibility with SESAME layout has been validated and confirmed.



An agreement has been established with chosen company (France) to manufacture the beamline components and deliver them to SOLEIL.

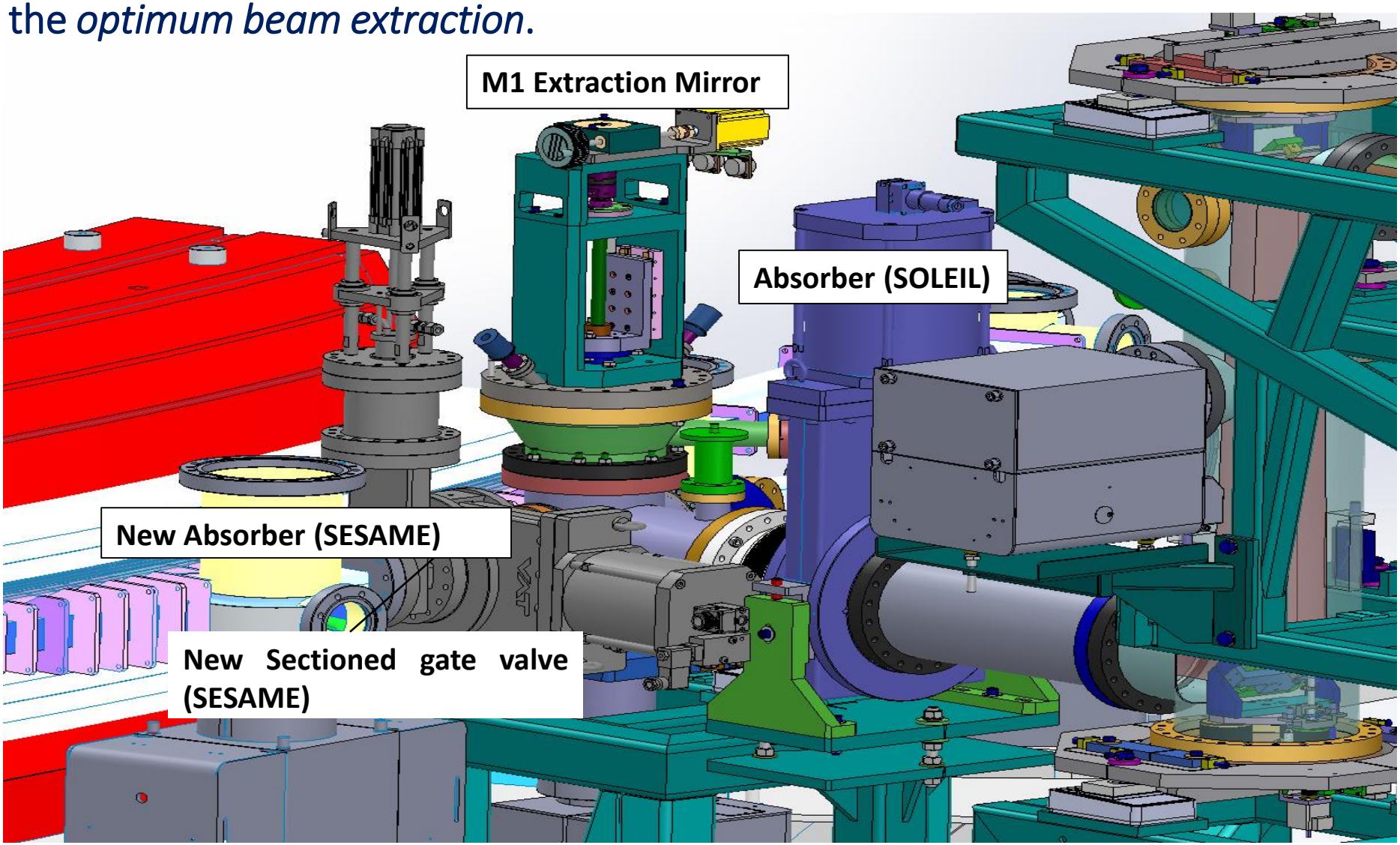
.. is divided into 2 stages to accelerate the construction:

Stage I: C01-C03
Stage II: C04-C05



Stage I: C01-C03 Progress:

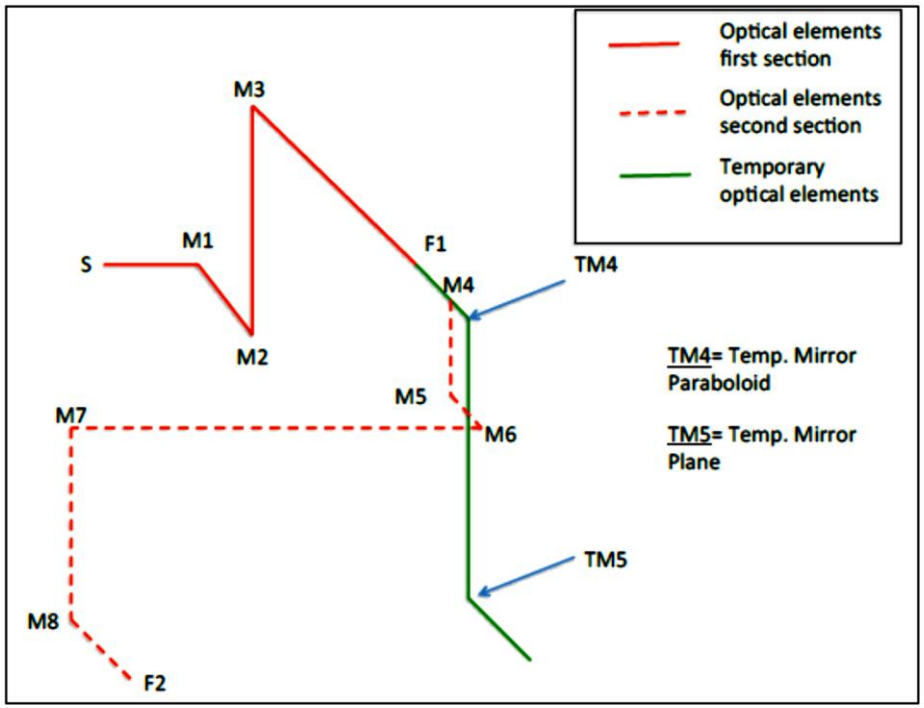
New modifications (SESAME-SOLEIL) have been introduced to the beamline 3D Design for the protection of the first mirror (critical component) and to ensure the *optimum beam extraction*.

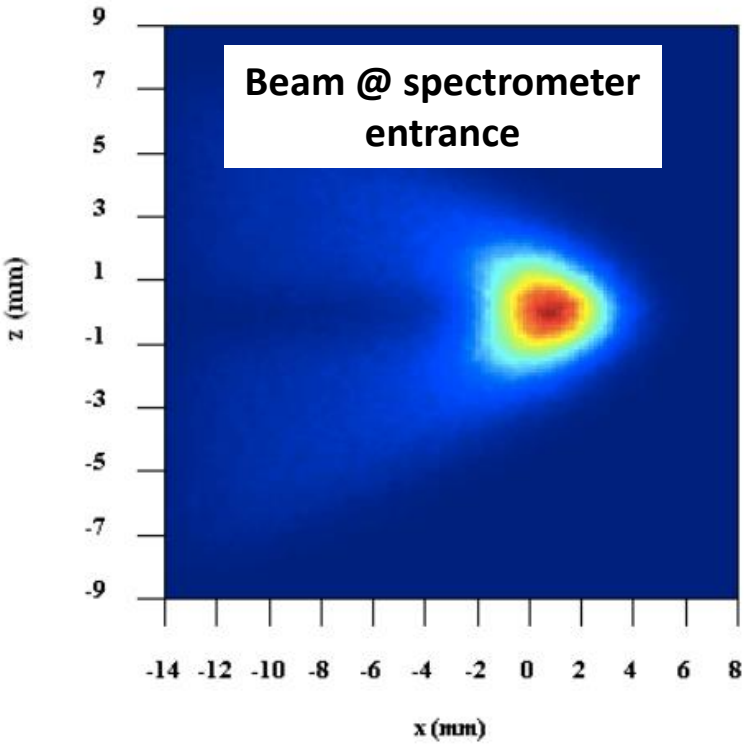


Stage II (C04-C05) Progress:

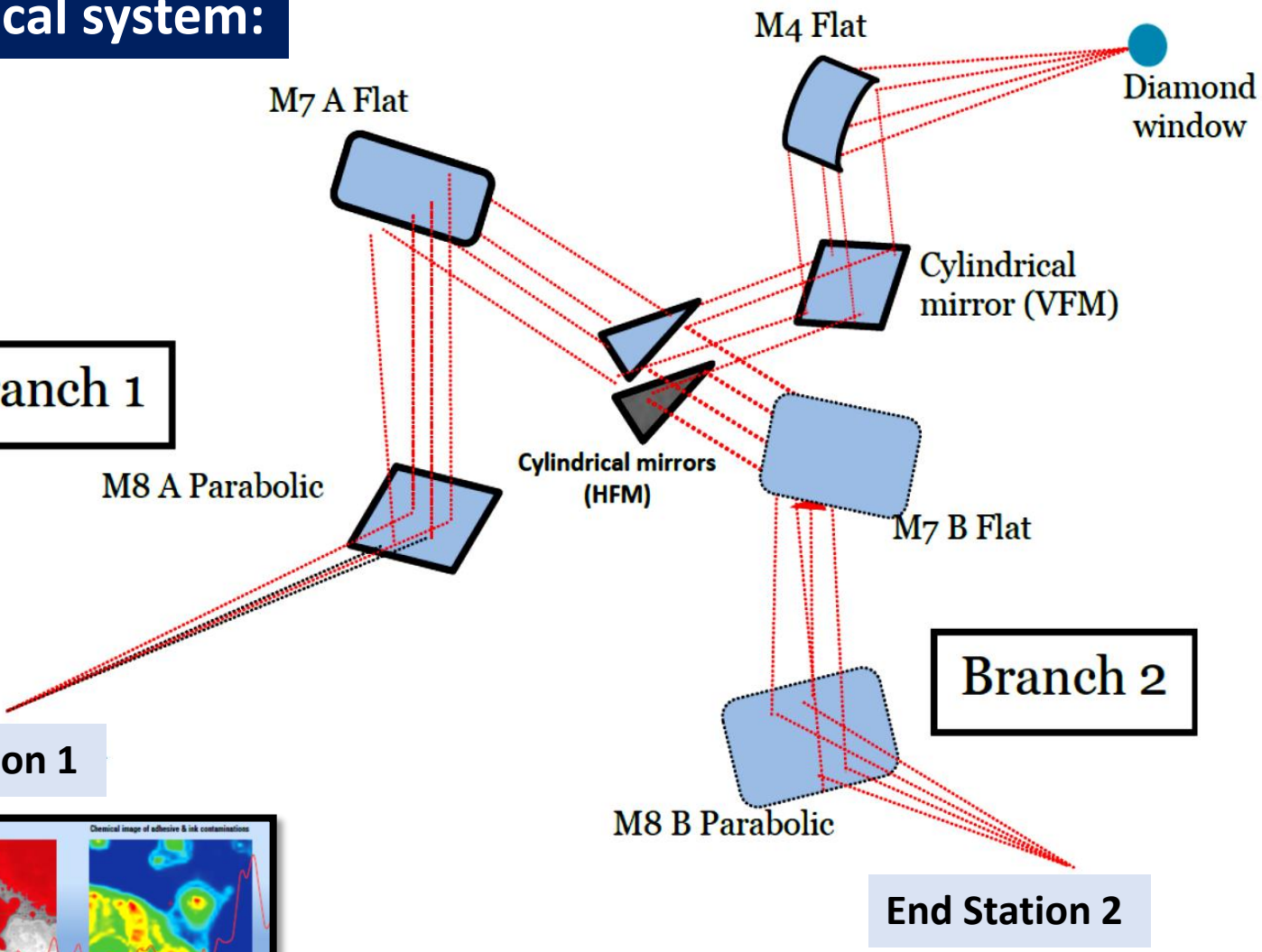
The construction of the second part of the beamline aims at propagating the beam, reshaping it, and adapt to the size to the spectrometer entrance. A new optical set-up is proposed to secure DAY-1 Commitments.

Feasibility of this option is checked with beam simulation



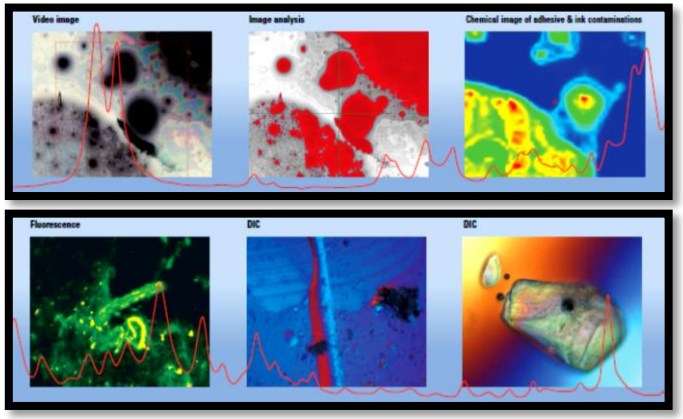


Beamline Optical system:



Working

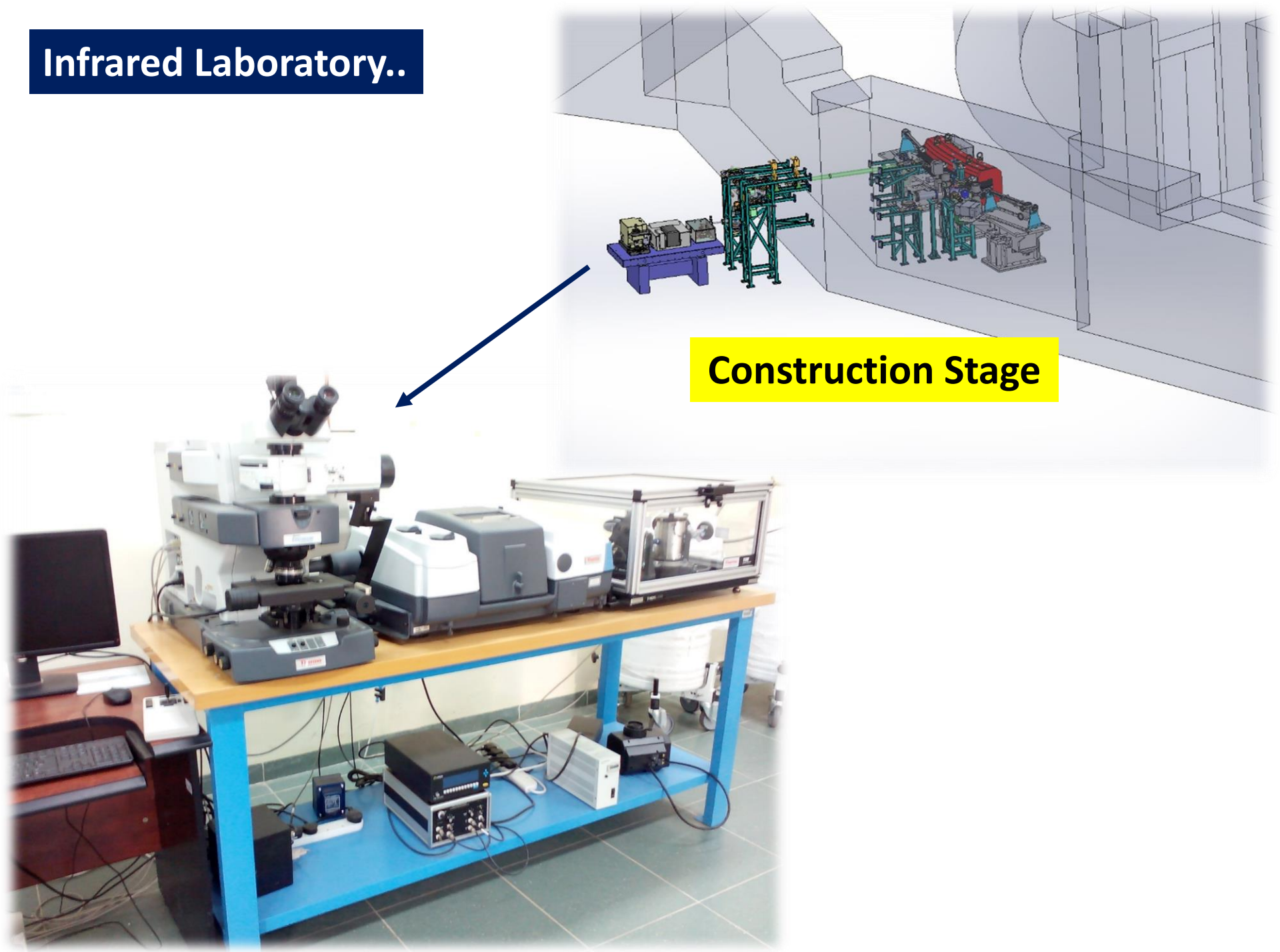
End Station 1



End Station 2

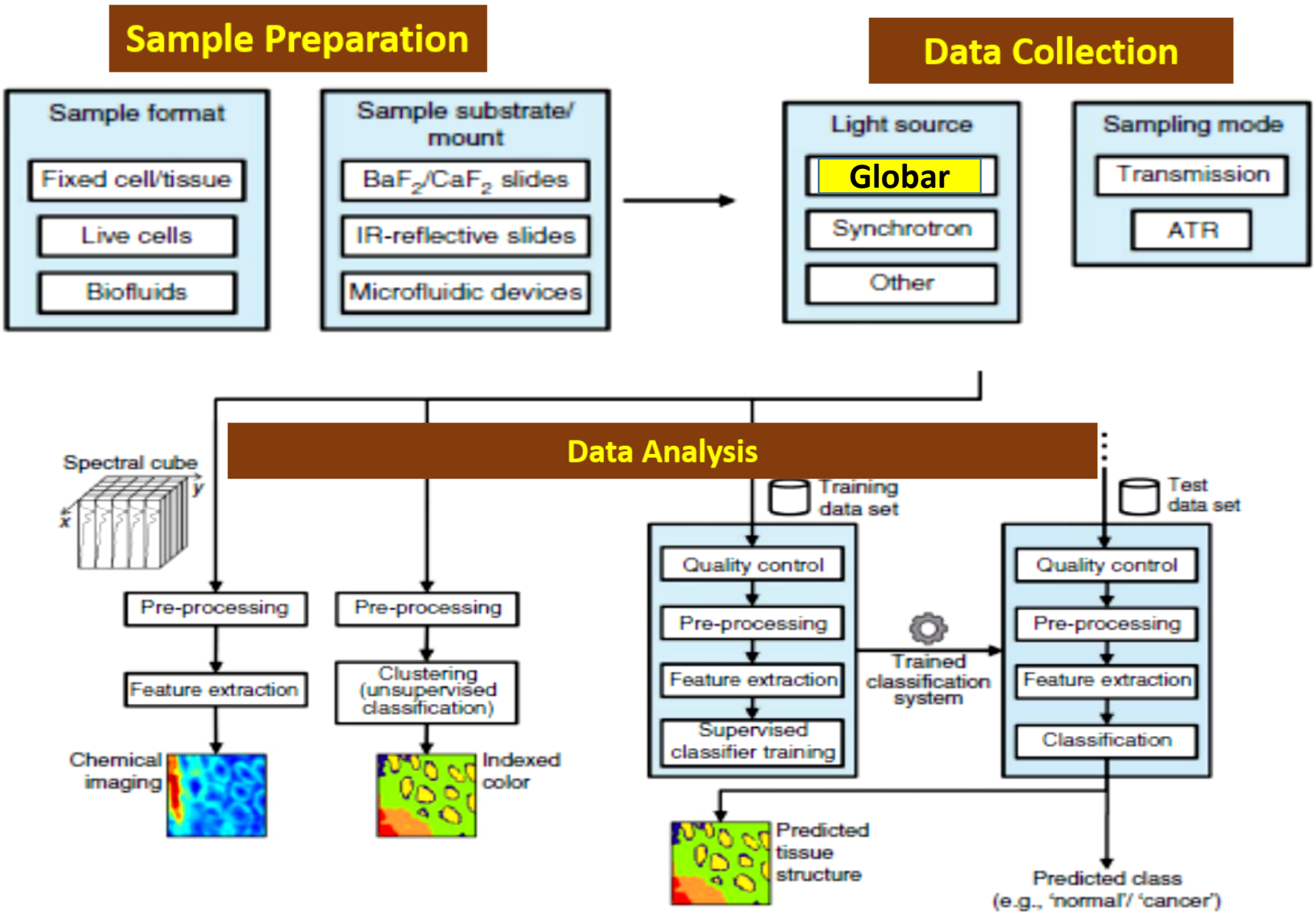
Postponed..

Infrared Laboratory..



Construction Stage

Work Flow for Imaging and Diagnosis



Producing Science…

Members and Observers

Peer Review Committee:

- BESSY II, Germany
- ELETTRA, Italy
- NSLS, USA

"Human Histone Deacetylases Are Flexible Enzymes"-

Collaborators:

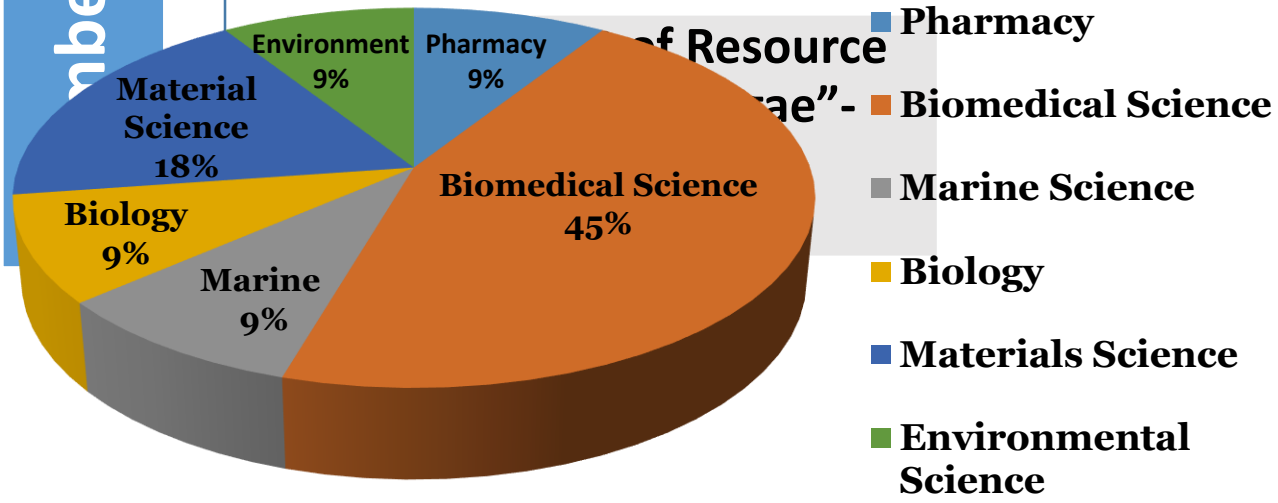
Egypt, Israel, UK and USA

"Photodynamic Therapy of Human Melanoma Cells"-

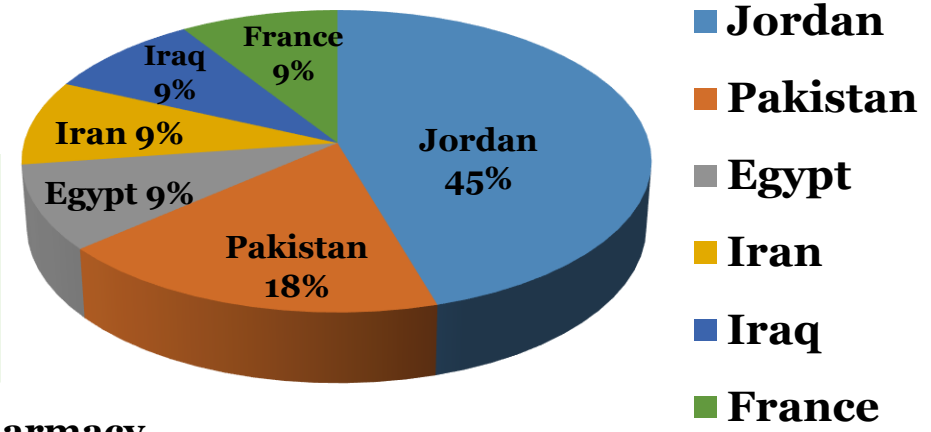
Collaborators:

Egypt and USA

Proposed Research fields



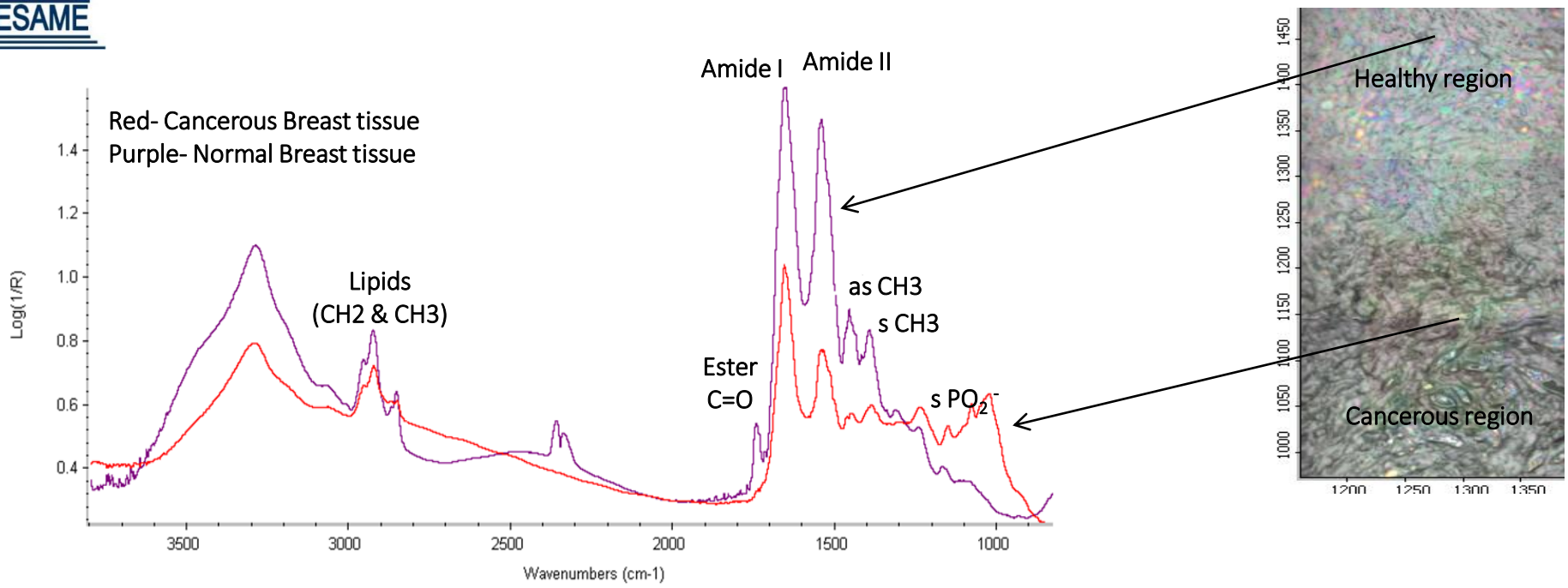
IR-Beamline Call for Proposals, 2013



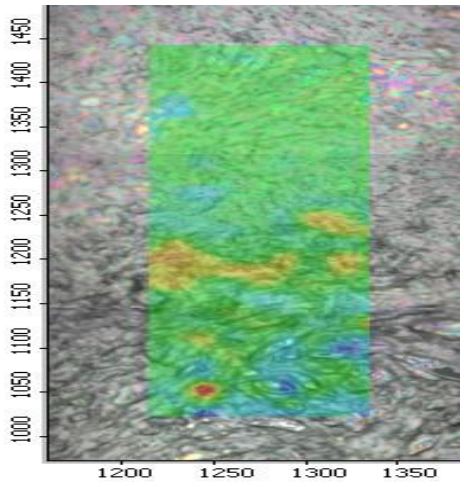
12 submitted
11 accepted

CONVENTIONAL Infrared source

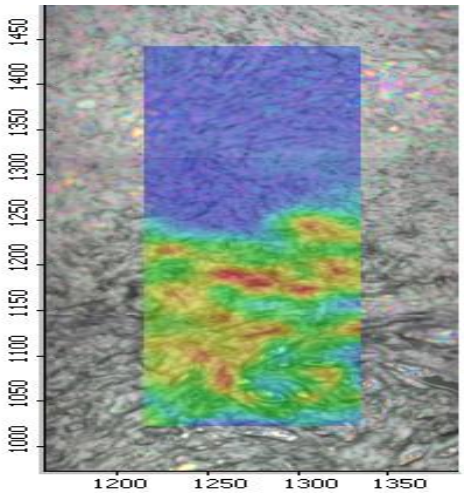
Infrared Microspectroscopic Analysis of Breast Cancer. *Fatemeh Elmi, Iran.*



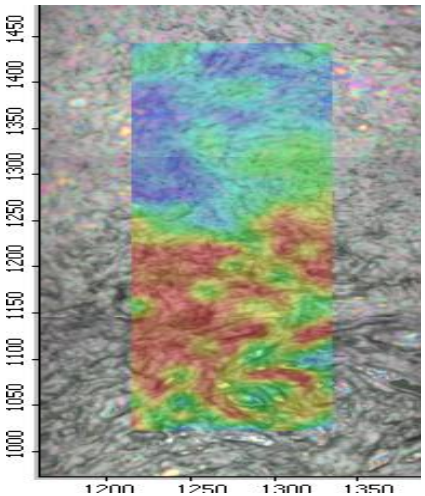
Lipids



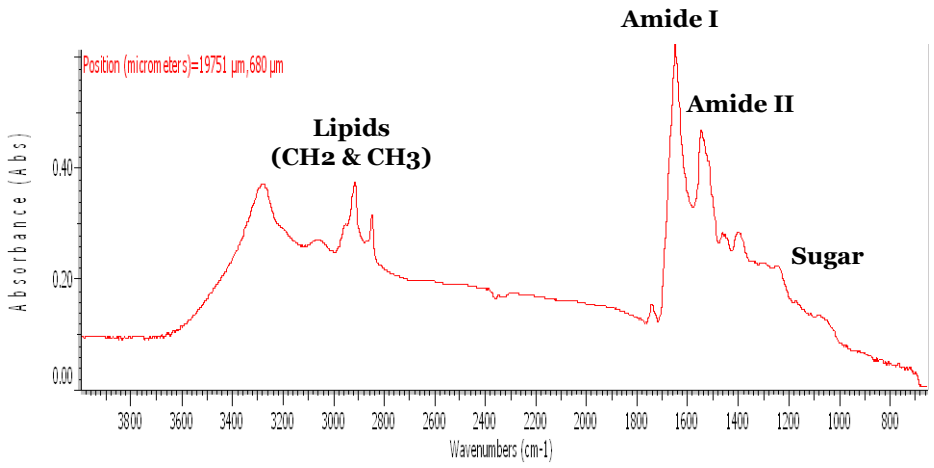
Carbohydrates

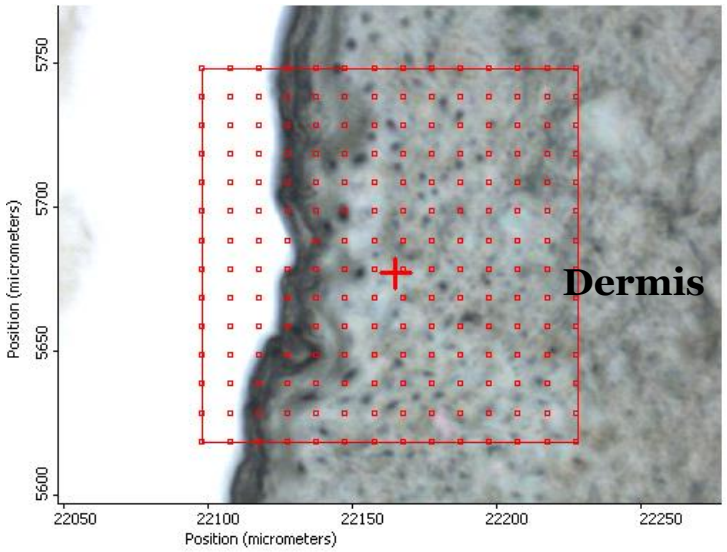


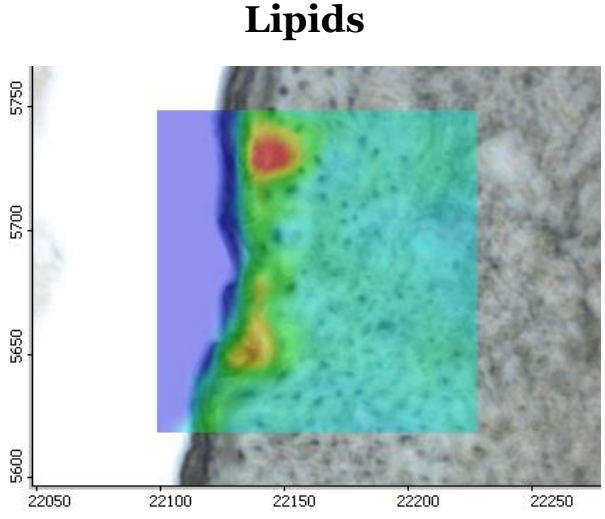
Proteins

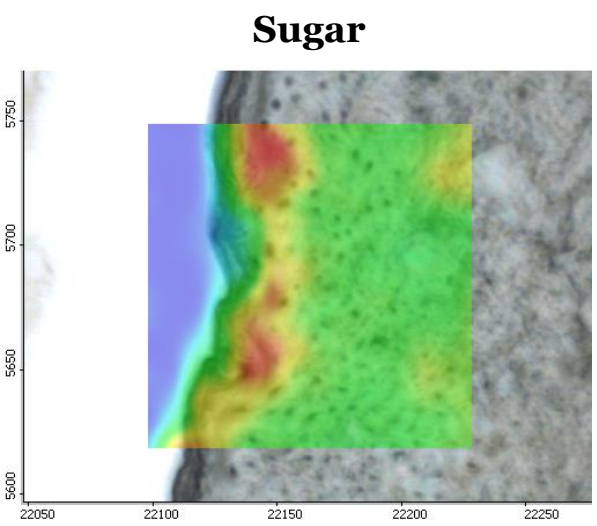


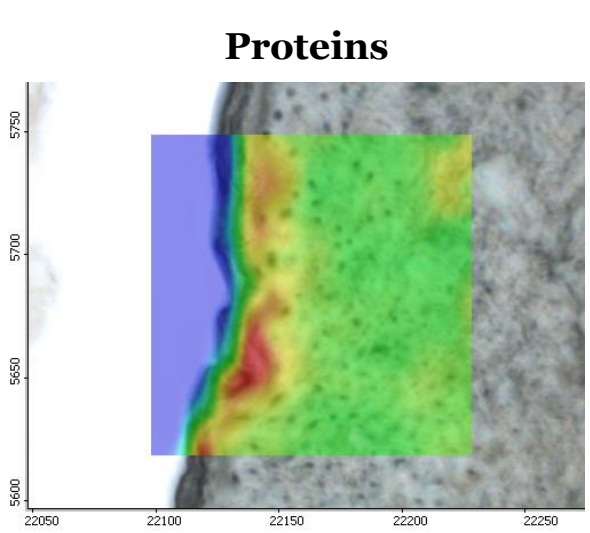
Effects of pharmaceutical products on skin layers. *Randa Mansour, Jordan.*











Nanoparticles in glioma cells: combined Infrared microspectroscopy and X-ray irradiation effect. Immaculada Martinez-Rovira, France.

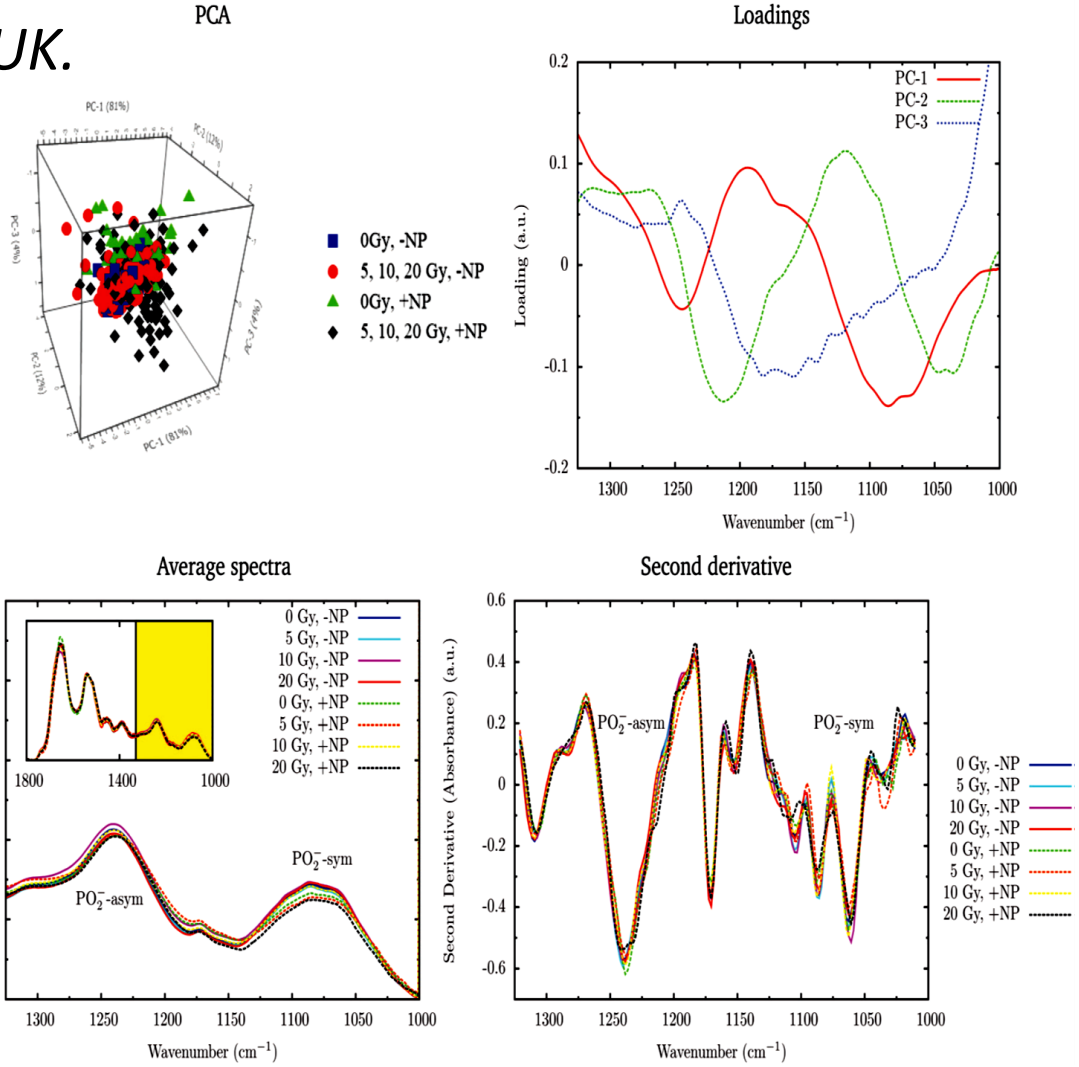
Collaborators:

SESAME, France, Spain, and UK.

Funding: *SESAME, IAEA, ICTP, Richard Lounsbery Foundation, CNRS and L'Oréal-UNESCO.*

T_0

DNA



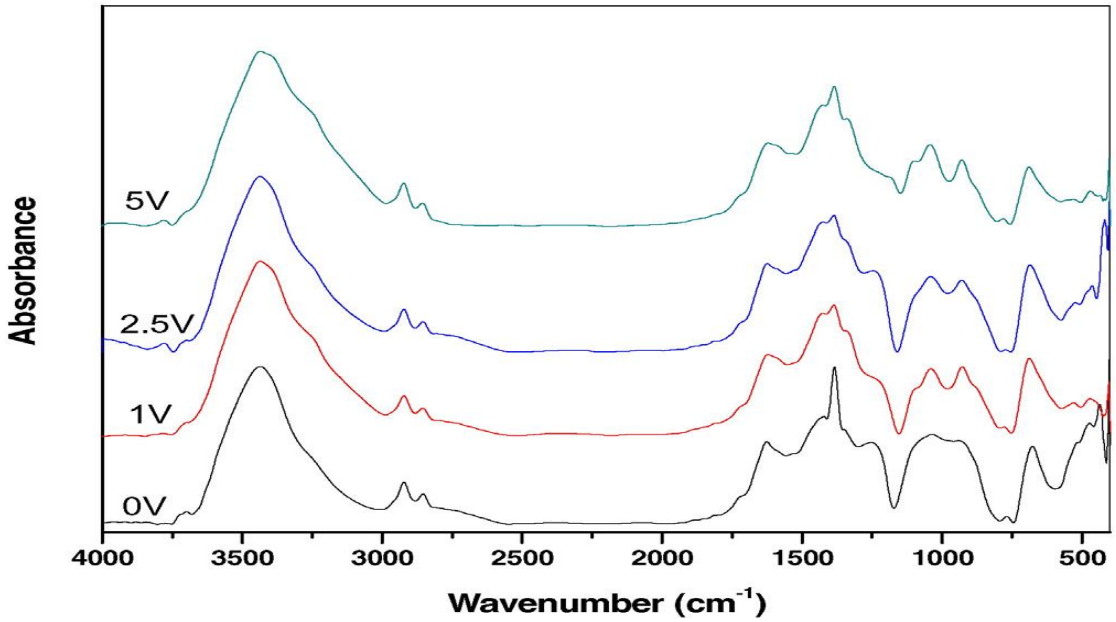
New Approach for structural evaluation of some doped-lithium glasses.

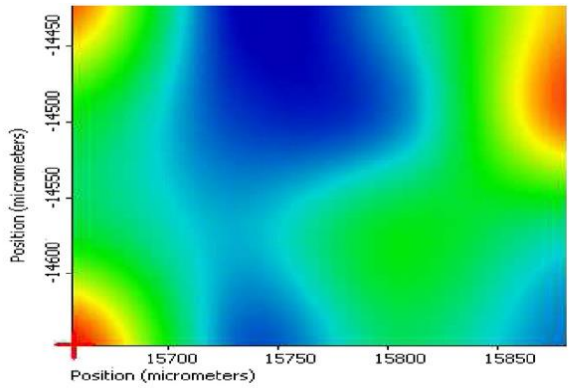
Amr Abdelghany, Egypt.

Collaborators:

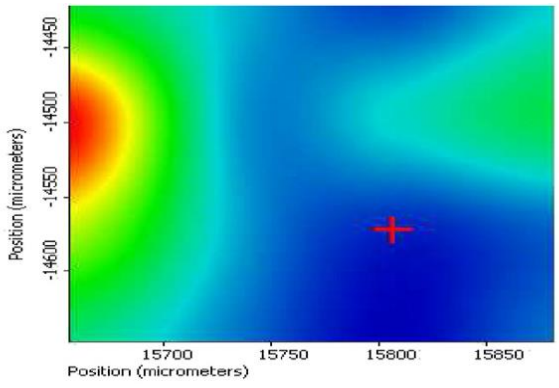
SESAME, NRC-Egypt.

Funding: *SESAME, ASRT, NRC-Egypt.*

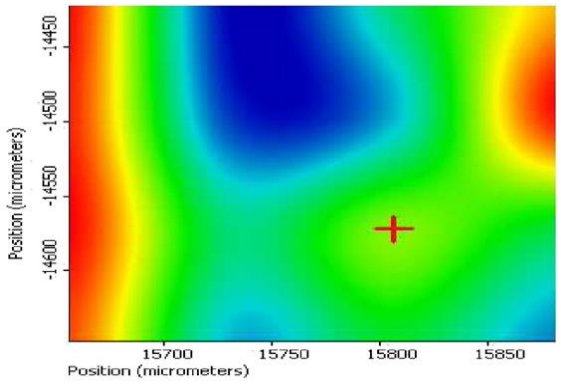




(a) at 3540 cm^{-1}



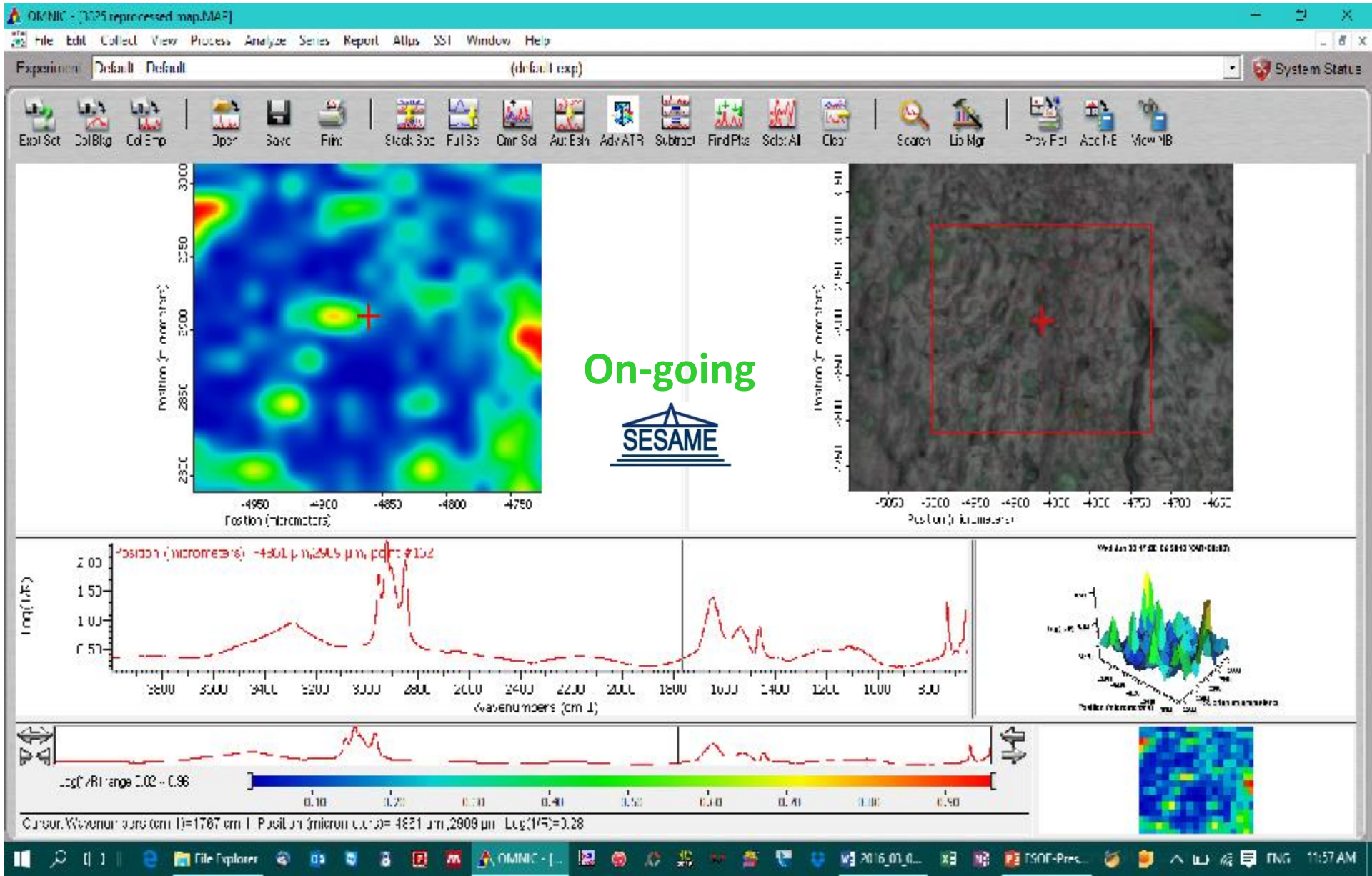
(b) at 1140 cm^{-1}



(c) at 1290 cm^{-1}

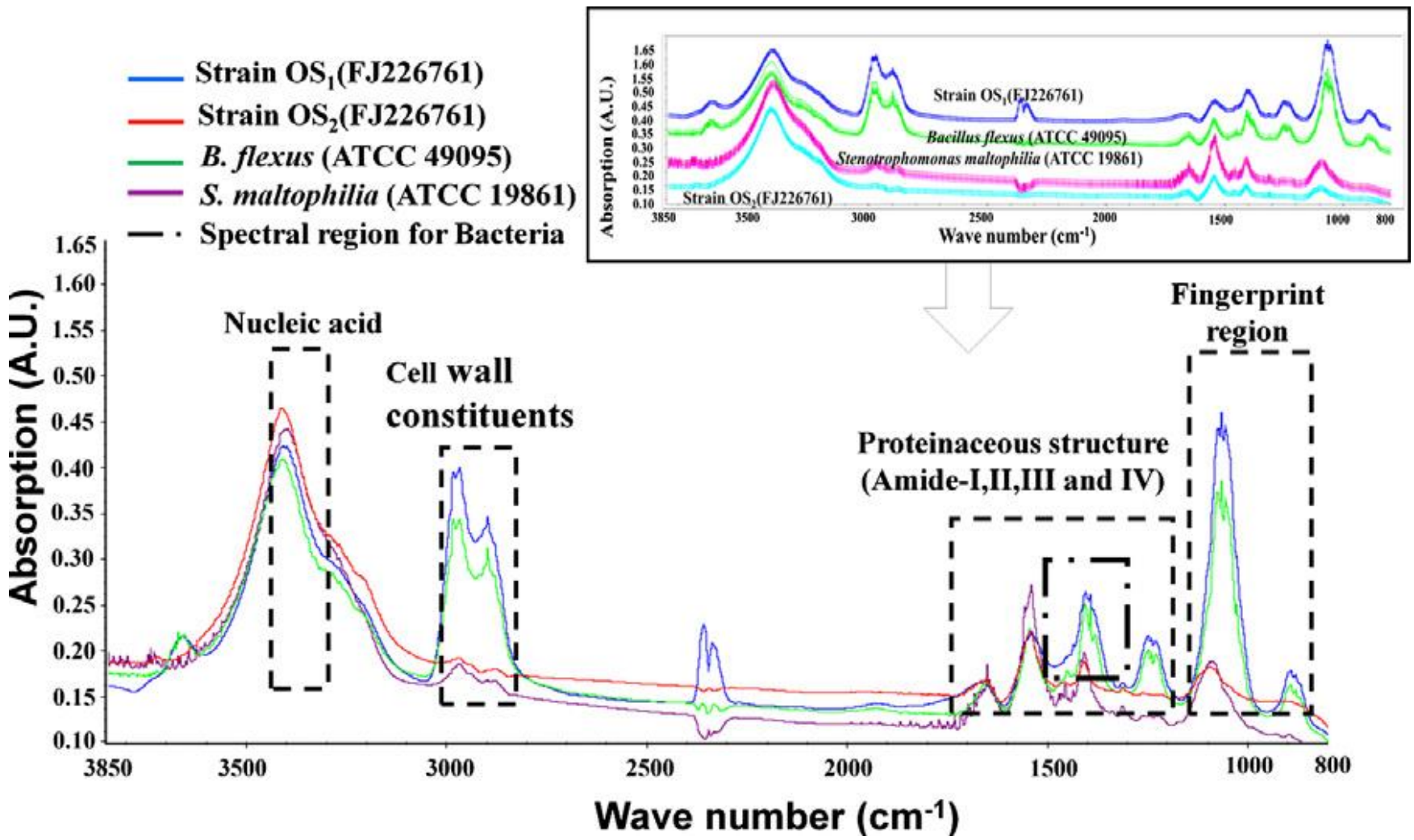
Structural Changes of Malignant and Benign Human Breast Tissues.

Sohaila Rehman, Pakistan.



Examination of cytotoxicity on wounds granulation tissues and the identification of different microorganisms in diabetic foot infections.

Deema Jaber, Jordan.

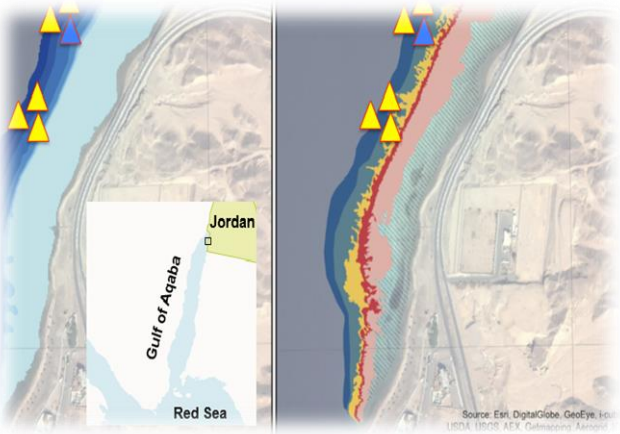


J.P. Maity et al. / Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 116 (2013) 478–484

SESAME people…

Marine Biology:

Mamoon Al-Rshaidat, *Jordan*: Role of Coral Reef Sponges in Carbon Cycling on Red Sea Coral Reefs.



Plant Biology:

Fatma Afifi, *Jordan*: Environmental Pollution effect on Medicinal Plants.

Archaeology:

Jan Gunneweg , Israel: Dead Sea Scrolls and Pottery at Qumran.

ICTP - International Centre for Theoretical Physics

- The SESAME infrared laboratory is recognized as an Affiliated Centre of the ICTP, Trieste, Italy.

Equipment + 3-6 Months Fellowships at SESAME IR Laboratory

"Different Drugs Effects on the Human Skin Tissue"

Worood Shadeed, Palestinian Authority

"Activity of a combination of Doxorubicin/Quercetin on Breast Cancer Cell Lines"

Nirmeen Elmadany, Palestinian Authority

Next Fellowship is granted to: Rawan Qawasmi, Palestinian Authority

Scheduled Experiments:

"Spectroscopic and Molecular Modelling Study of Egyptian Soil Organic Samples."

Hend Shahid, Palestinian Authority

"Characterization of Cell Wall Chemical Composition Differences and Developmental activity of some Jordanian Plant Species Using FTIR"

Khaldoun Al-Hadid, Jordan

Egypt (ASRT) – Italy (INFN) Joint Call for Proposals

Submitted February 2015

Approved May 2015

Academy of Scientific Research And Technology
أكاديمية البحث العلمي والتكنولوجيا

INFN Istituto Nazionale di Fisica Nucleare

"Leptin and Related Lipid Metabolism after Radiation Exposure: Combined Heavy Charged Particles Irradiation, Infrared Imaging, and Biological Approaches."

Partners:
(PI) Helwan University, EG.
(PI) LNF, INFN, Frascati, IT
ENEA, Frascati, IT
LNS, INFN, Catania, IT

SESAME

VI-SEEM receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 675121.

Vi-SEEM

- 3 years project that aims at creating a unique Virtual Research Environment (VRE) in Southeast Europe and the Eastern Mediterranean (SEEM),

SESAME

WP3 – e-Infrastructure services

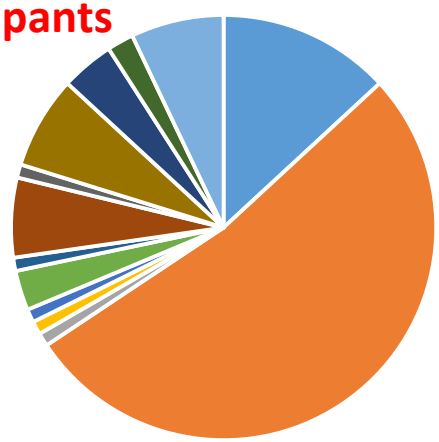
SESAME 13th Users' Meeting in numbers

IR-workshop: 133 out of 185 applicants (Members + Non-members)

SESAME MEMBER	IR Session /TOTAL
EGYPT	36/50
IRAN	15/20
ISRAEL	2/2
JORDAN	46/65
PAKISTAN	4/10
PALESTINIAN AUTHORITY	7/12
TURKEY	15/19

SESAME UM 2013

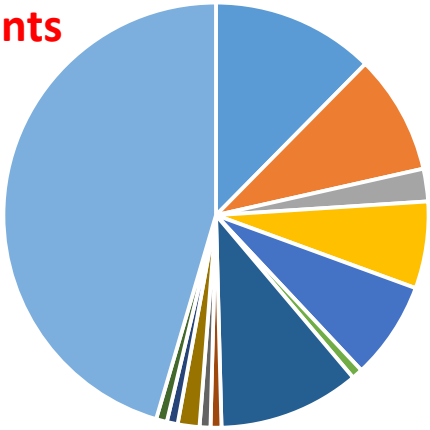
100 Participants



- Egypt
- Jordan
- Spain
- Canada
- Cyprus
- USA
- France
- Iran
- Israel
- Pakistan
- Turkey
- UK
- Palestinian Authority

SESAME UM 2014

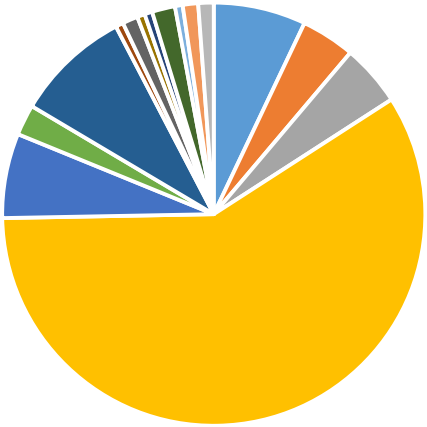
117 Participants



- Egypt
- Iran
- Israel
- Pakistan
- Palestinian Authority
- Cyprus
- Turkey
- USA
- France
- Spain
- UK
- South Africa
- Jordan

SESAME UM 2015

171 Participants



- Egypt
- Pakistan
- Iran
- Jordan
- Palestinian Authority
- Israel
- Turkey
- Canada
- UK
- France
- USA
- Switzerland
- Sweden
- Kazakhstan
- Italy


2015

Better late than never!


THANK YOU!