



SESAME

Synchrotron-light for Experimental Sciences and
Applications in the Middle East

SESAME: Status and Perspectives

Giorgio Paolucci
Scientific Director - SESAME

Location of SESAME



SESAME location in Allan, Jordan

Location of SESAME



SESAME location in Allan, Jordan

SESAME Members & Observers



Members: Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestine, Turkey.

Observers: Brazil, Canada, China (People's Republic of), the European Union, France, Germany, Greece, Italy, Japan, Kuwait, Portugal, Russian Federation, Spain, Sweden, Switzerland, the United Kingdom, the United States of America.

Objectives:

- Foster excellence in science and technology in the Middle East.
- Reverse brain drain in the region.
- Enhance regional science and technology infrastructure.
- Contribute to improved understanding among peoples of diverse backgrounds through peaceful scientific cooperation.

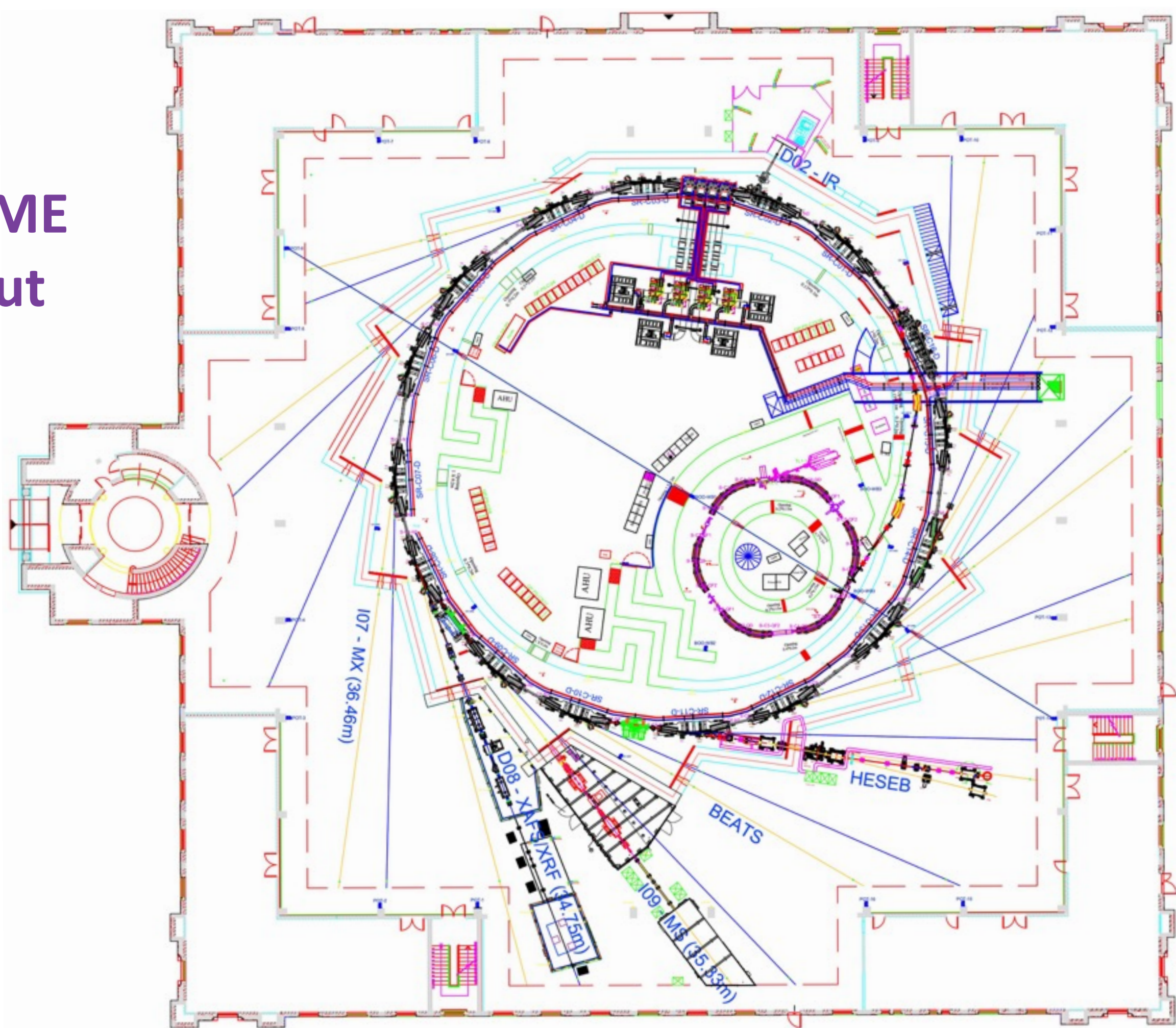
“Day-One” Beamlines

No	Beamline	Energy Range	Source Type	Comments
1	XAFS/XRF	4.5-30 keV	Bending Magnet	<ul style="list-style-type: none"> • Helmholtz-Zentrum Dresden-Rossendorf/ESRF • New focussing optics • New Hutch • Novel Detector
2	IR (Infrared Spectromicroscopy)	0.001-3 eV	Bending Magnet	<ul style="list-style-type: none"> • New beamline • Mod to storage vacuum chamber
3	MS (Materials Science)	5-25 keV	2.1 Tesla MPW (SLS)	<ul style="list-style-type: none"> • SLS XO4SA • New Hutch • Donated Dectris Detector
4	Macromolecular Crystallography (MX)	~4-~13 keV	IVU	<ul style="list-style-type: none"> • New Beamline • Partial support by the Jordanian Scientific Research Support Fund

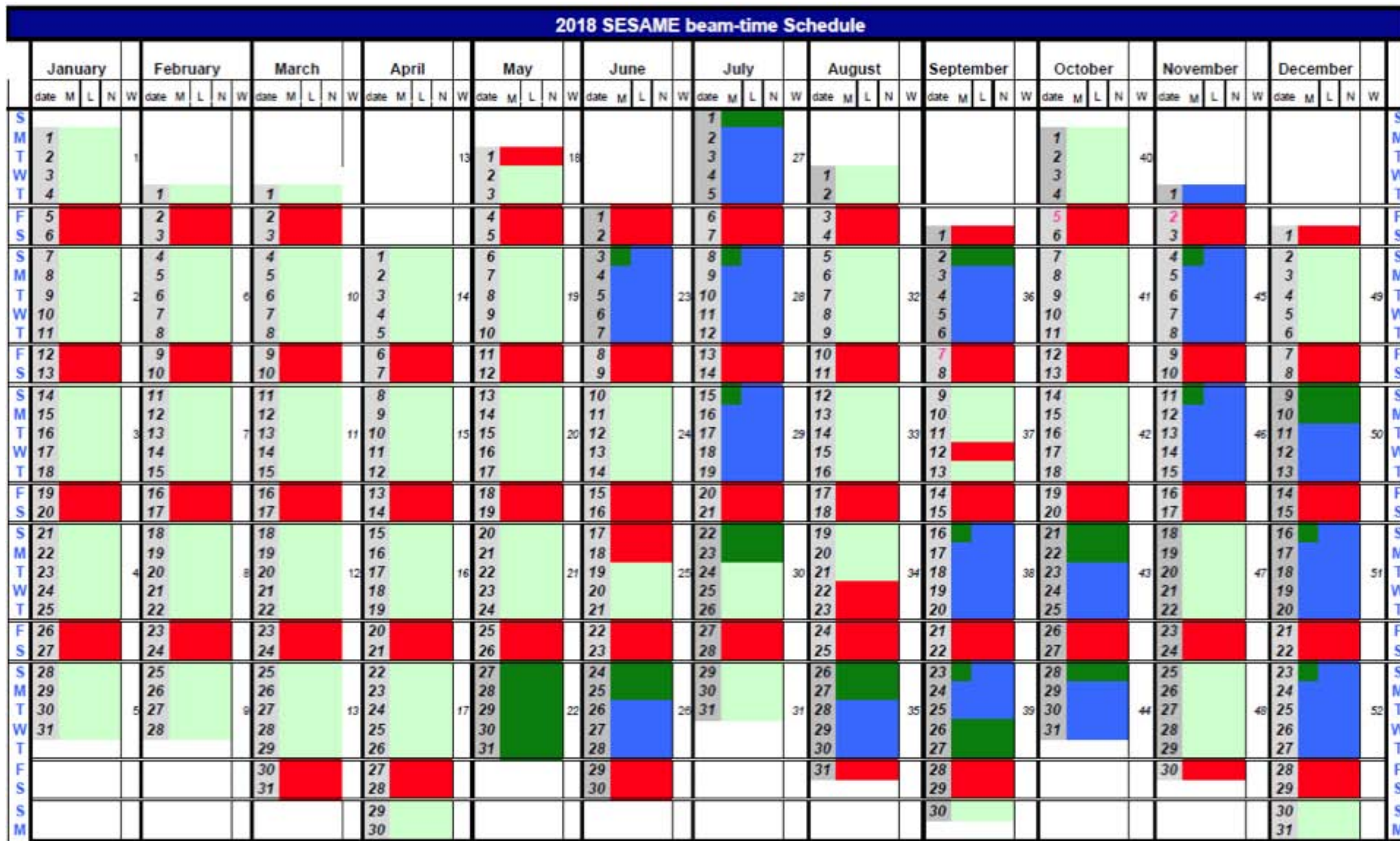
New projects

No	Beamline	Energy Range	Source Type	Comments
5	BEATS (BEAmline for Tomography at SESAME)	~4.5 - ~30 keV	Super Bend or Three pole wavelength shifter	<ul style="list-style-type: none"> • EU funded (~6 M€ total, ~3.6M€ for SESAME)
6	HESEB (HEImhotz-SEsame Beamline)	~70 - ~1800eV	EPU	<ul style="list-style-type: none"> • Supported by the Helmholtz Gemeinschaft + Possible User Consortium • New beamline • Refurbished EPU from HZB

SESAME layout



2018: SESAME Started Users' Operation



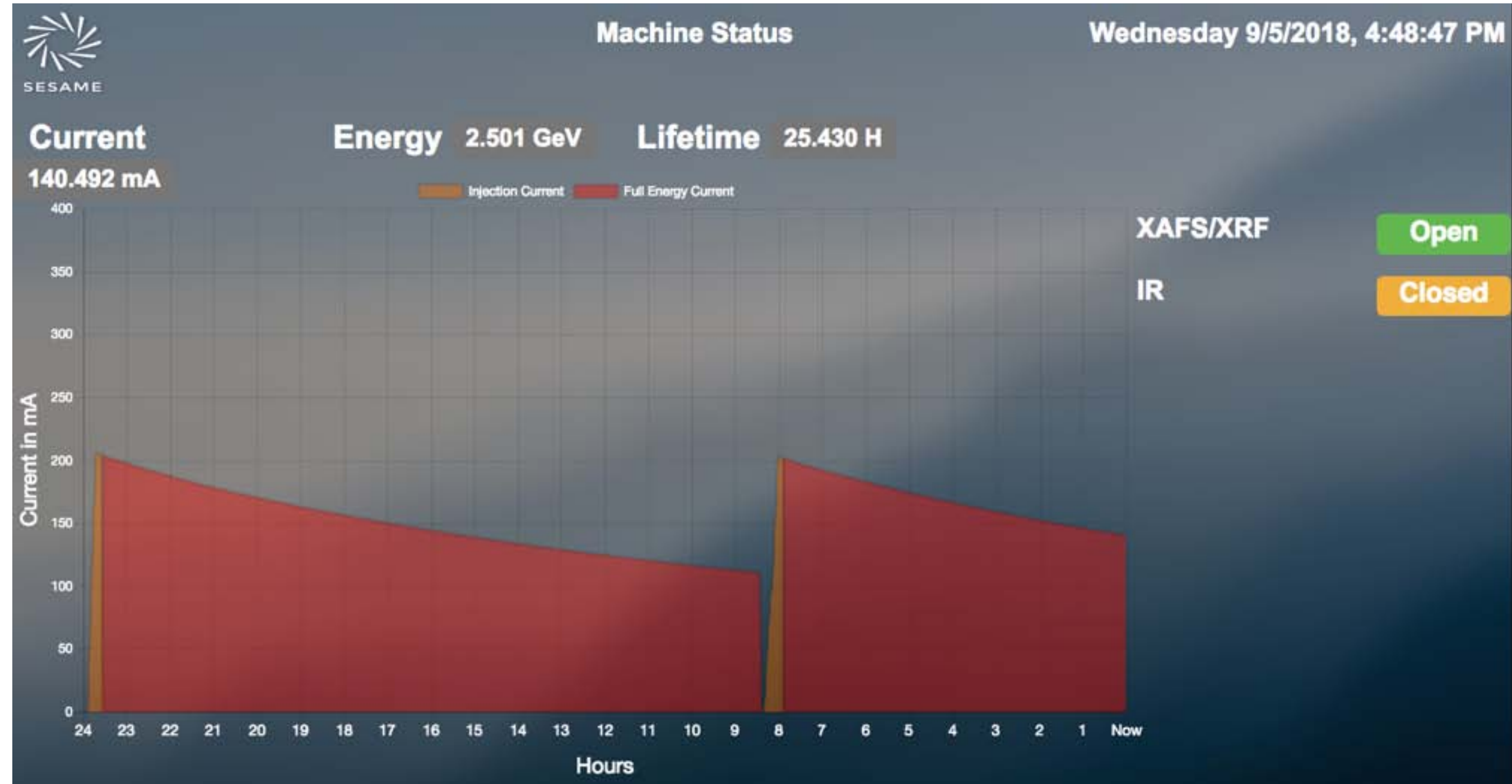
USER
MACHINE
Holidays
Shutdown

Since April 6 runs – 2088 h - 87 days (20 MDs/67 operation) – projec. 3000 h/year

Beamline commissioning until June 2018

First users in week 29 – 17th July 2018 – until now a total of 164 (94+70) users shifts

Two fills per day



... or maybe one in the next future



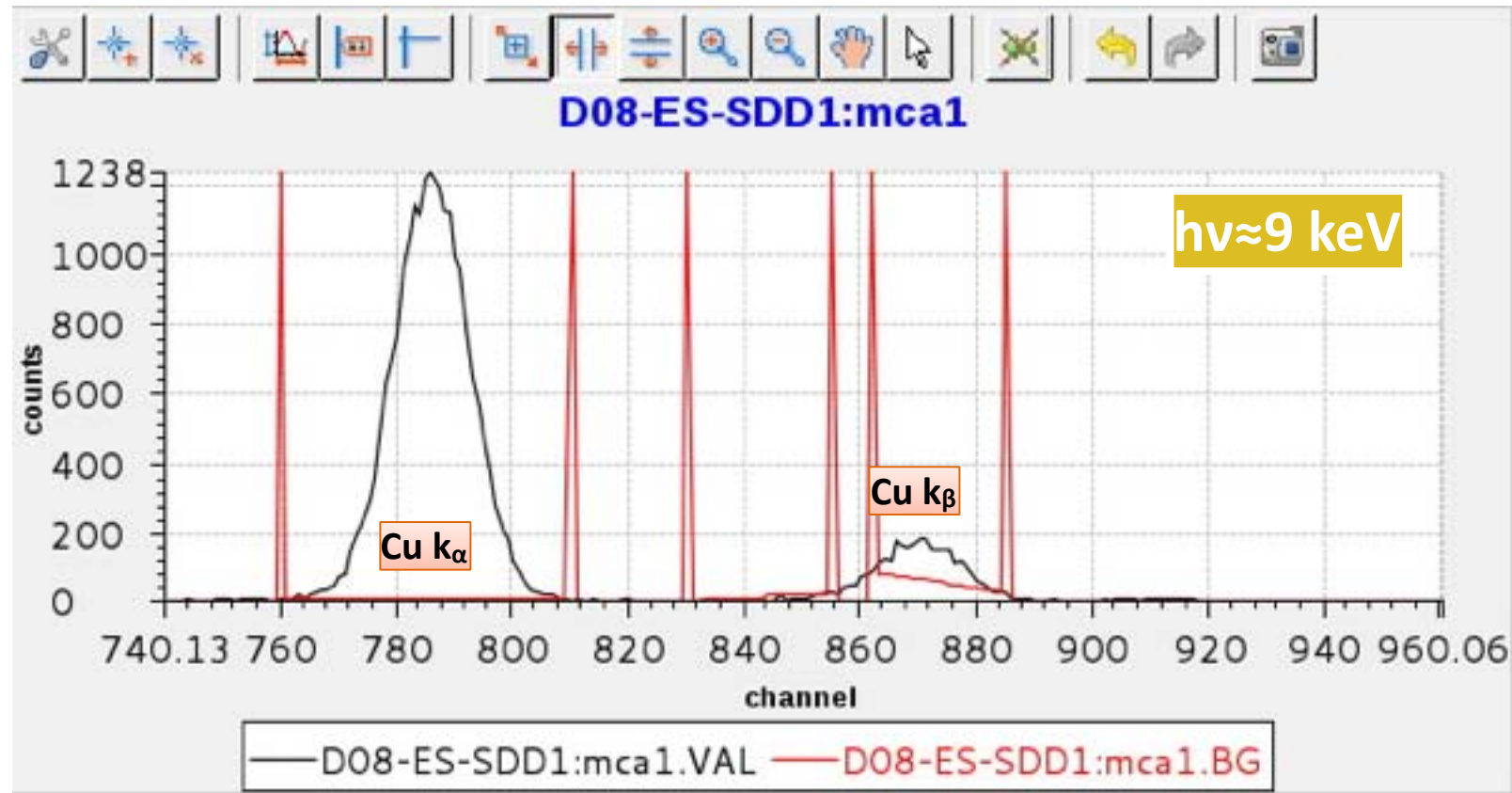
XAFS/XRF

XAFS/XRF

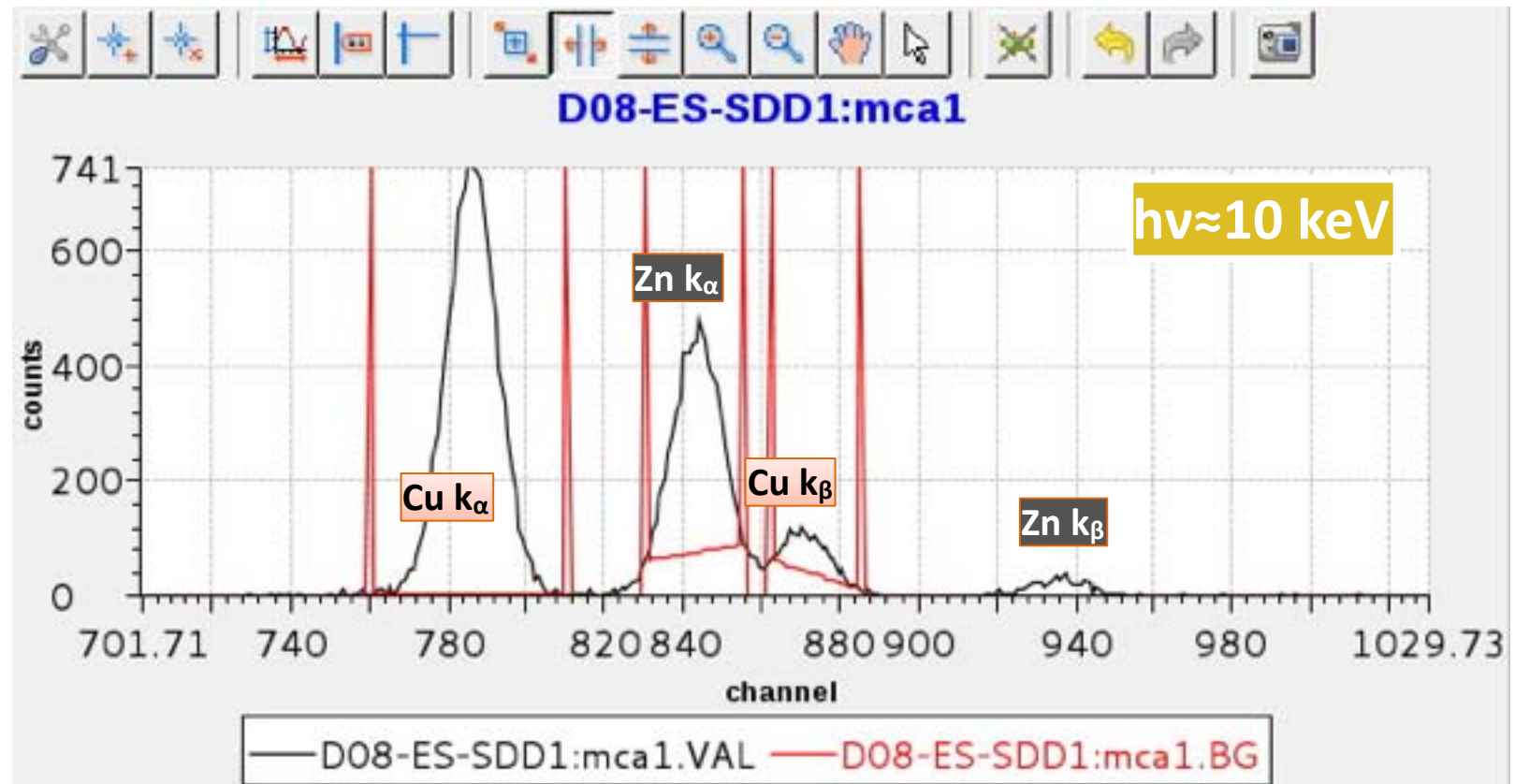
Hosting users since July 2018

XAFS/XRF

First monochromatic beam on November 22, 2017



XRF spectra of a bronze plate at 9 and 10 keV, showing the appearance of the Zn k emission lines (E_{Zn} k-edge ≈ 9.6 keV)



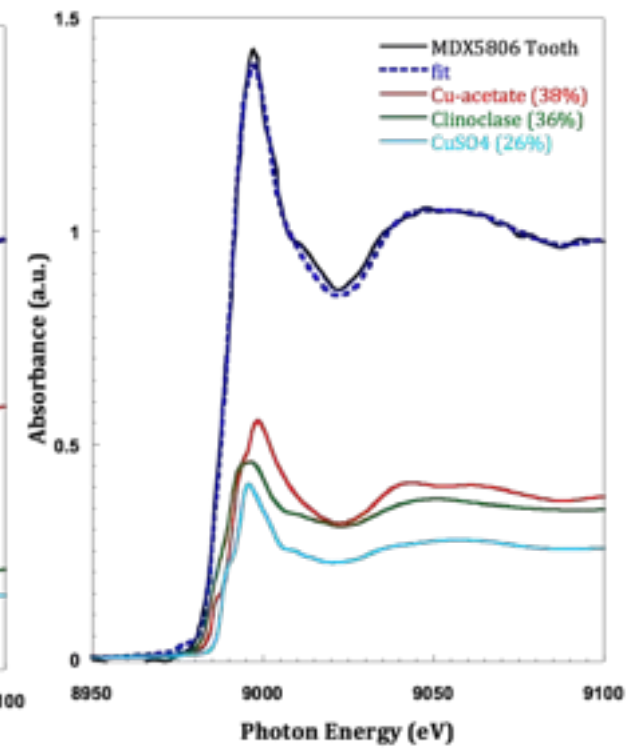
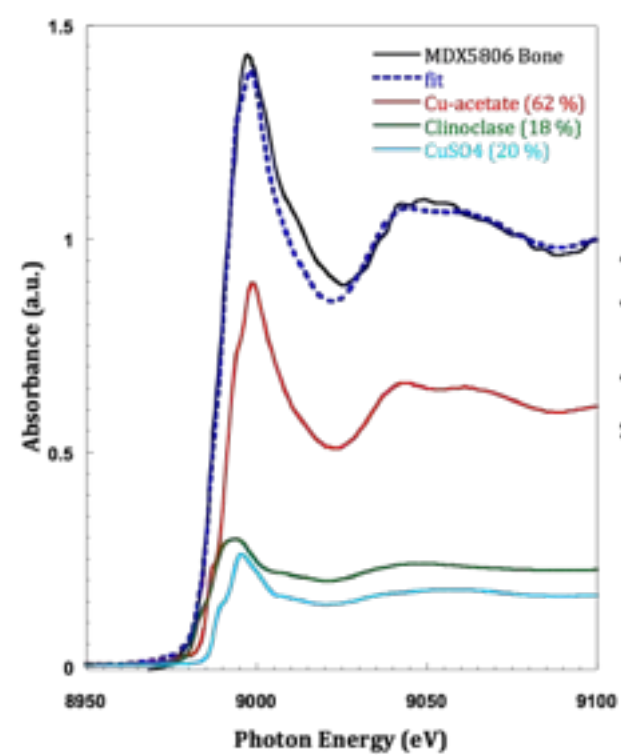
Exploration of diagenetic versus biogenic uptake of metal elements in ancient Cyprus and the surrounding region

Cyprus

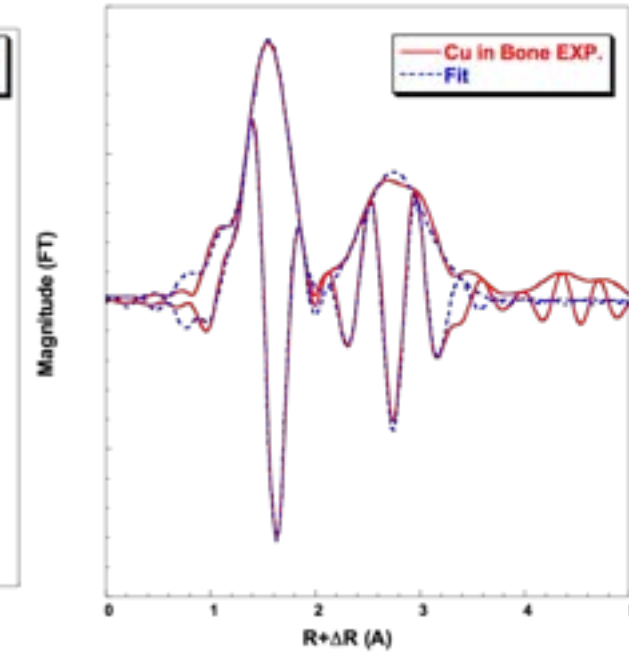
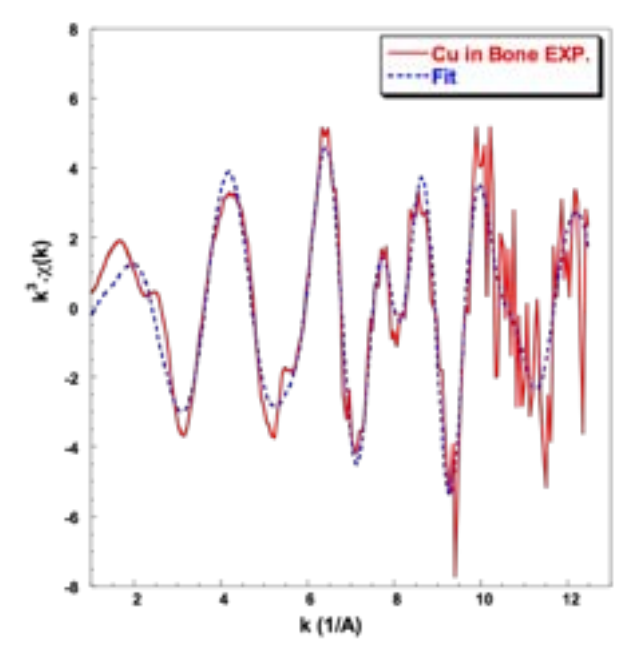


Dr. Kirsi Lorentz with her team at the XAFS/XRF control room

XANES



EXAFS

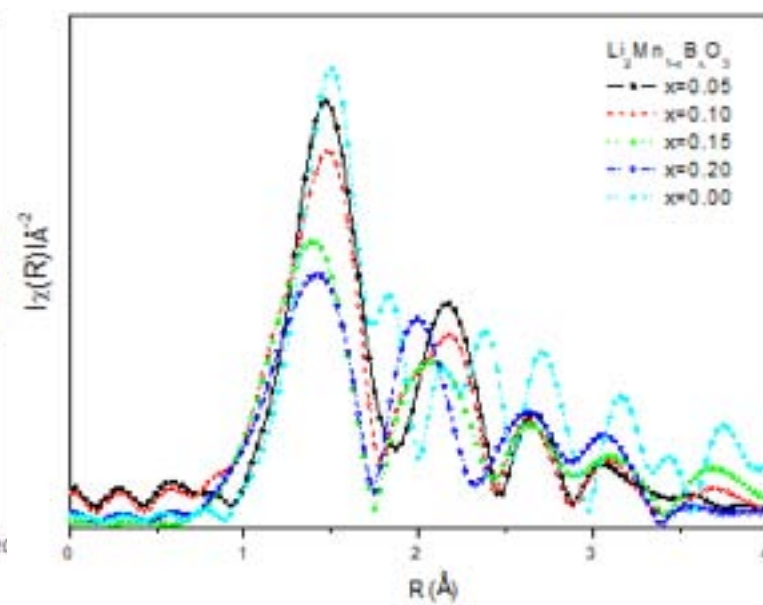
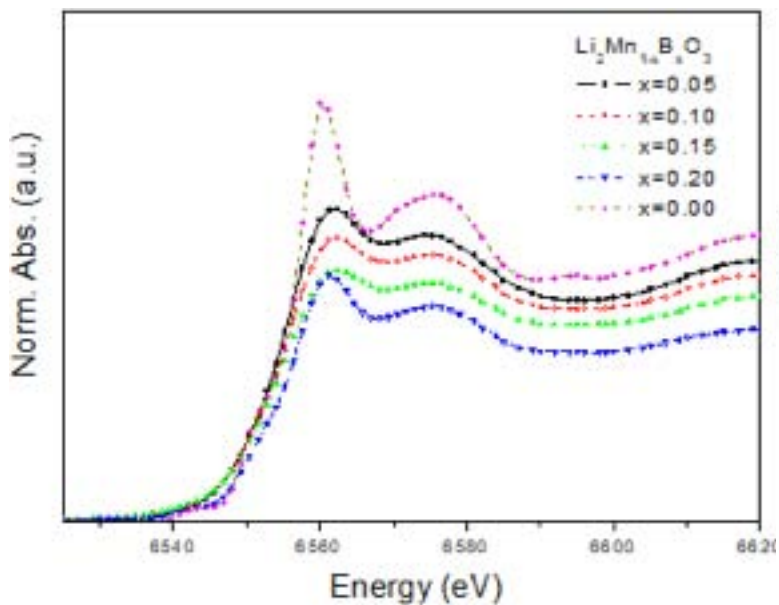


Influence of Boron Substitution on the electronic structure of $\text{LiMn}_{1-x}\text{B}_x\text{O}_2$ Battery Cathode

Turkey



Murat O. Ozkendir's team

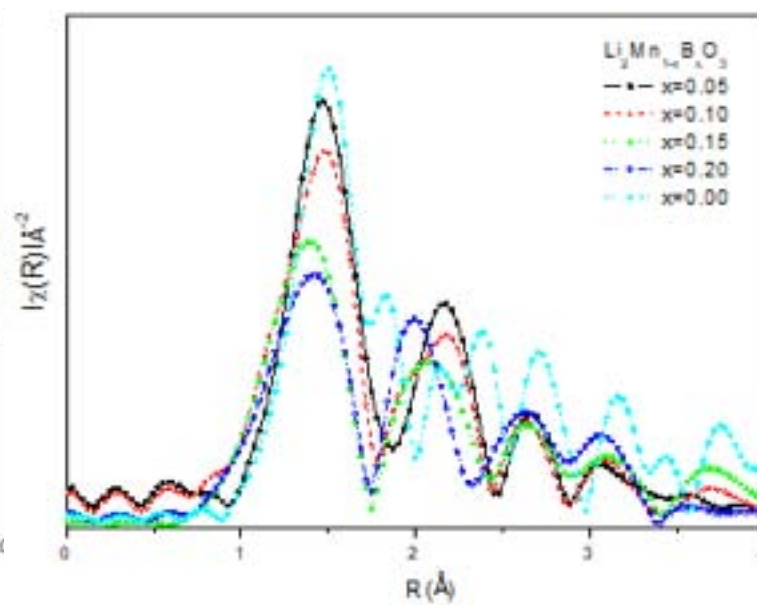
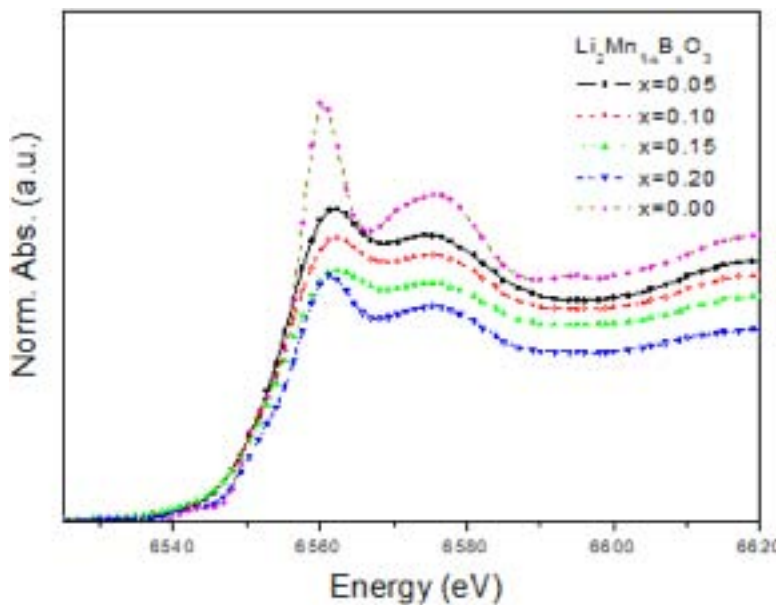


Influence of Boron Substitution on the electronic structure of $\text{LiMn}_{1-x}\text{B}_x\text{O}_2$ Battery Cathode

Turkey



Murat O. Ozkendir's team



Boron Activity in Li_2MnO_3 Cathode Materials

Çiğdem Kaya¹, Federica Bondino², Elena Magnano^{2,3}, Gultekin CELIK⁴, Sule ATES⁴, Sevdâ AKTAS⁴, Hadi BAVEGAR⁴, Intikhab Ulfat⁵, Messaoud Harfouche⁶, Tugba COLAK⁷, O. Murat Ozkendir^{1,7,8*}

1. → Merzin University, Institute of Natural Science, Dept. of Nanotechnology and Advanced Materials, Merzin, Turkey
2. → IOM-CNR, Laboratorio TASC, S.S. 14 km 163.5, 34149-Basovizza, Trieste, Italy
3. → Department of Physics, University of Johannesburg, PO Box 524, Auckland Park 2006, South Africa
4. → Department of Physics, Selçuk University, TR-42130-Saleuklu-Konya, Turkey
5. → Univ. Karachi, Dept. Phys., Karachi-75270, Pakistan
6. → Synchrotron-Light for Experimental Science and Applications in the Middle East (SESAME), Amman 19252, Jordan
7. → Tarsus University, School of Graduate Education, 33400-Tarsus, Turkey
8. → Tarsus University, Faculty of Technology, Energy Systems Engineering, Tarsus, Turkey

Abstract

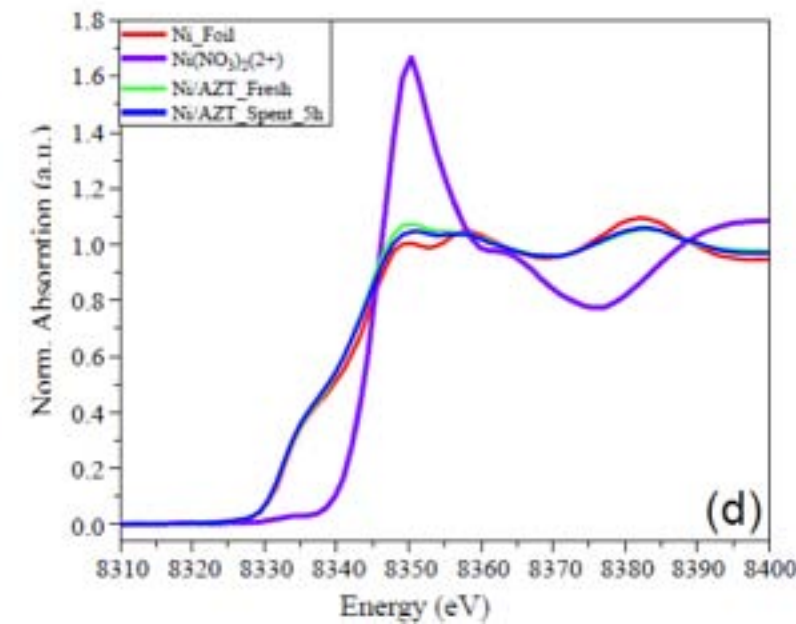
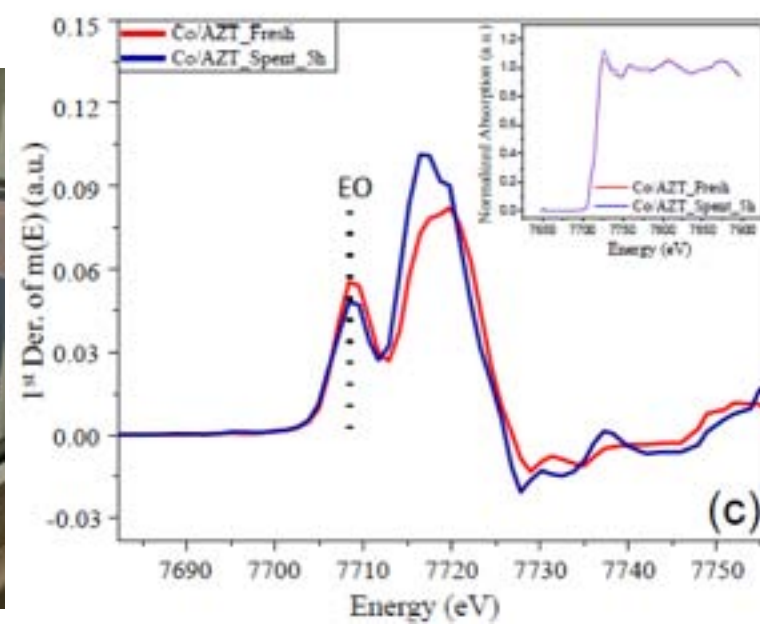
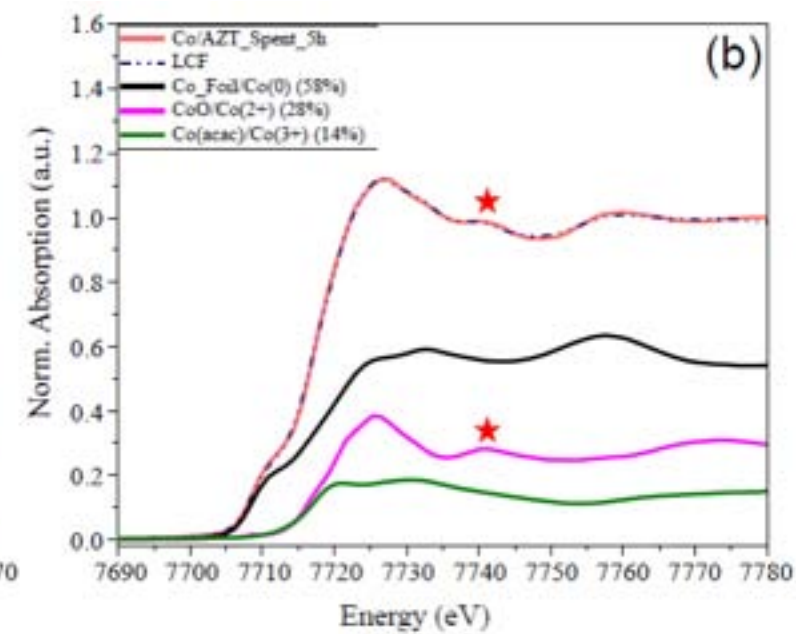
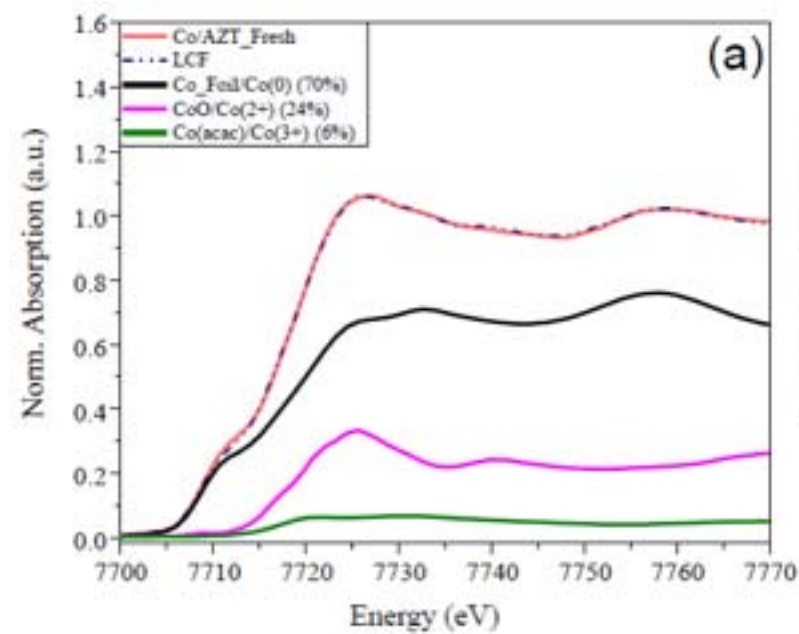
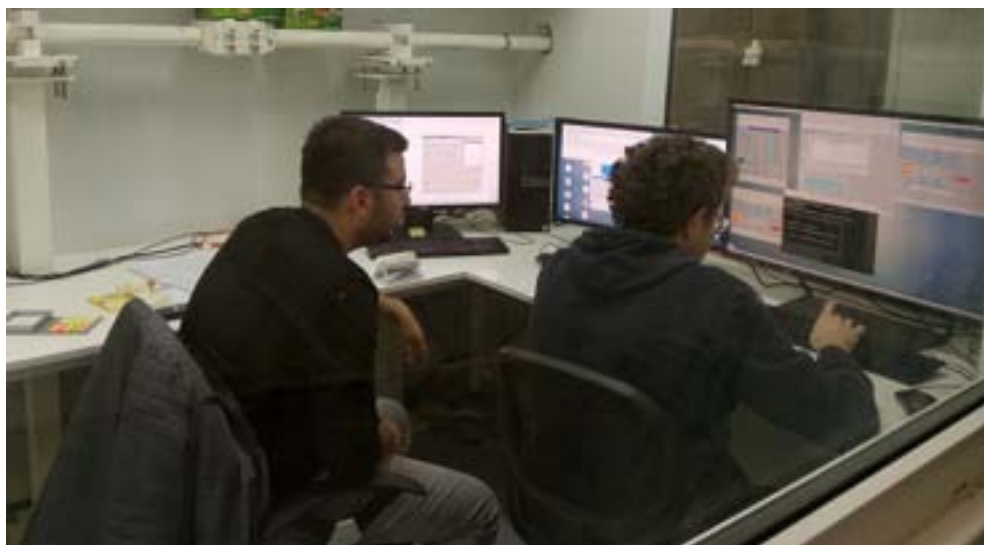
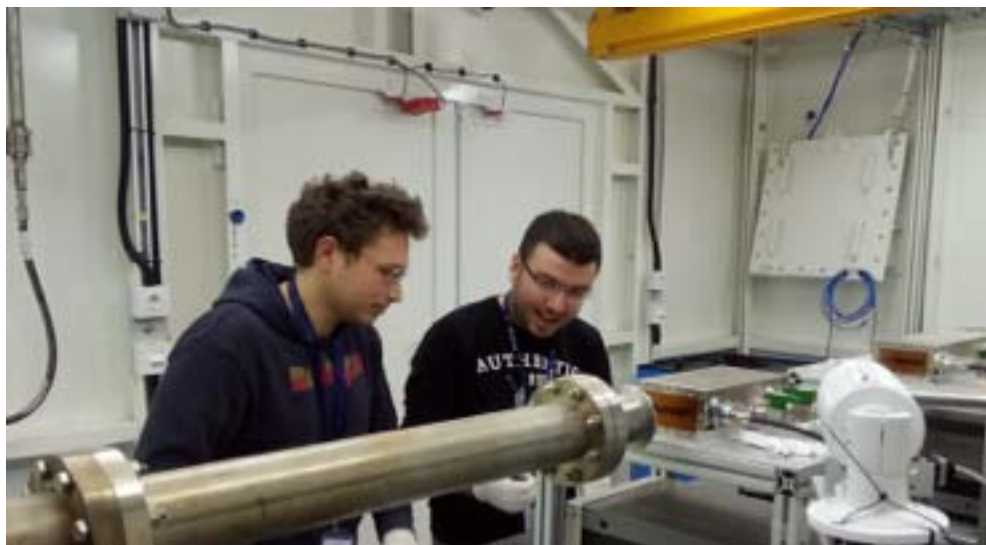
Boron substituted Li_2MnO_3 cathode materials have been studied in several studies and it is reported as inactive. In this study, crystal and electronic properties of the Li-ion cathode material with boron substitution were studied according to the general formula; " $\text{Li}_2\text{Mn}_{1-x}\text{B}_x\text{O}_3$ ", where x has values of 0.00, 0.05, 0.10, 0.15 and 0.20, respectively. The study revealed that, with the substitution of the boron atoms in the manganese coordinations in the Li_2MnO_3 cathode materials, boron atoms pretended as a landmark for the parent oxides by forming LiBO_2 crystal domains. In the studied samples, boron atoms were determined as the

Journal of Electronic Materials (JEMS)
(Submitted)

Exceptionally active and stable catalysts for CO₂ reforming of glycerol to syngas

Turkey

Emrah Ozensoy's group

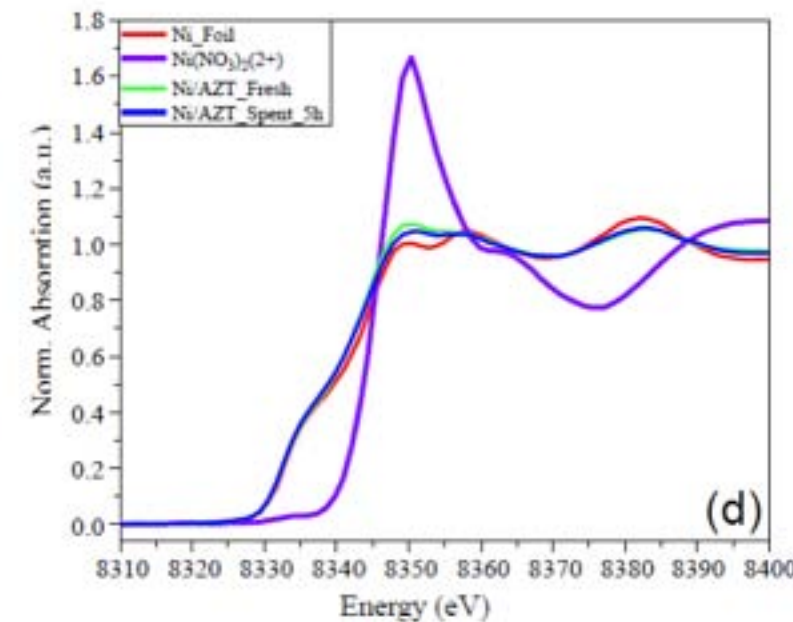
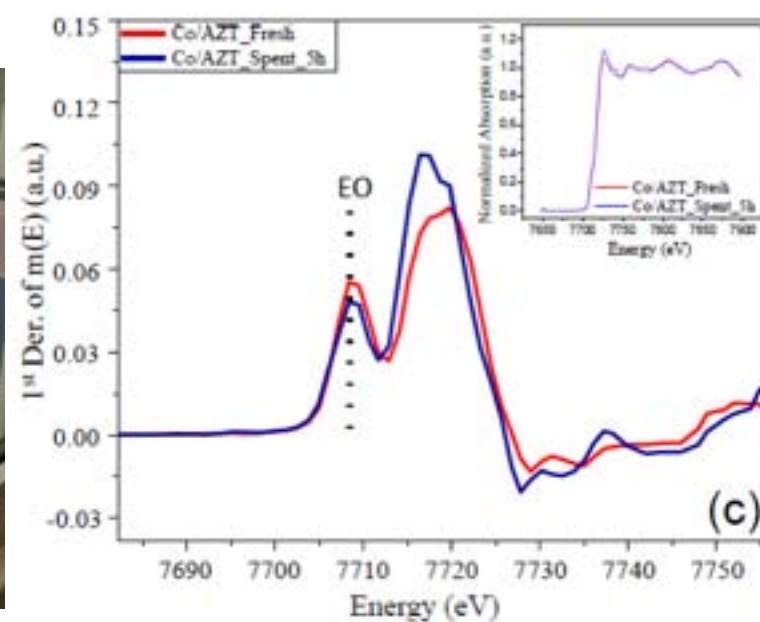
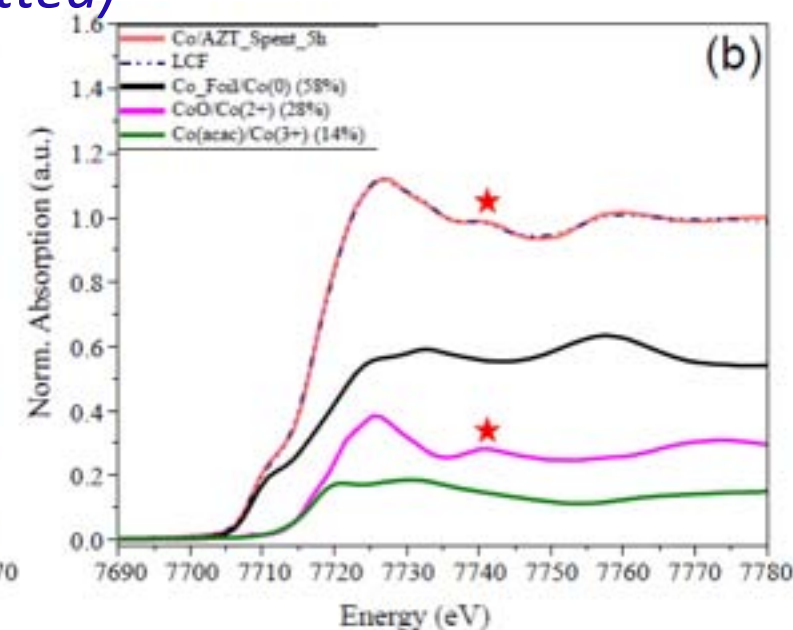
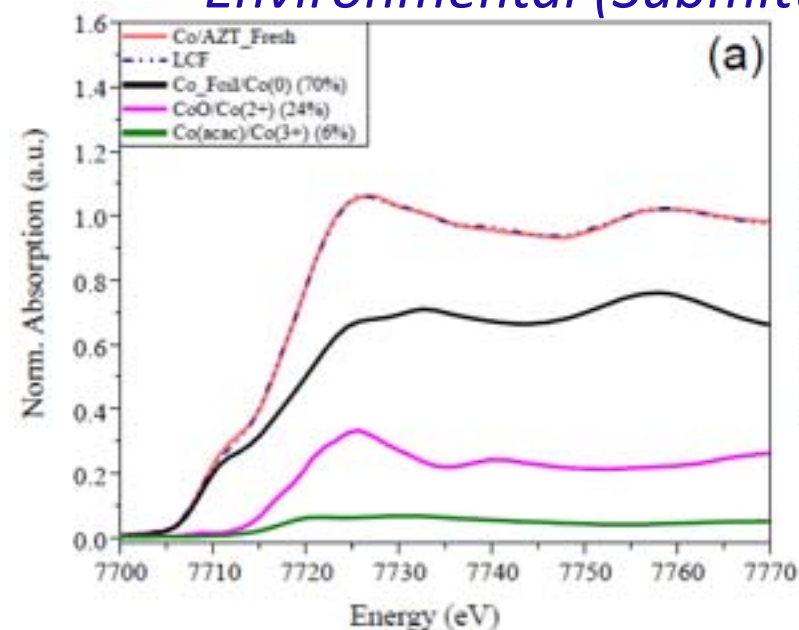
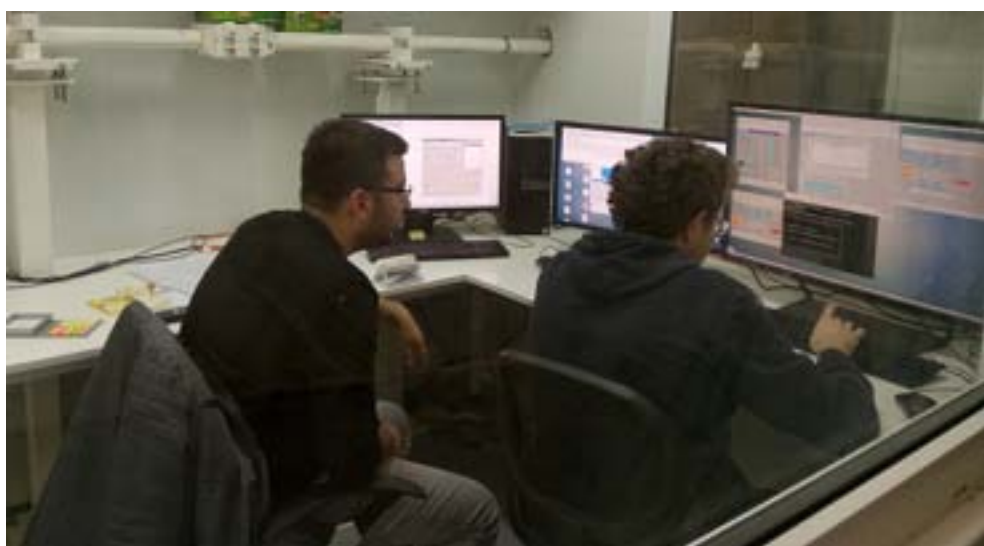
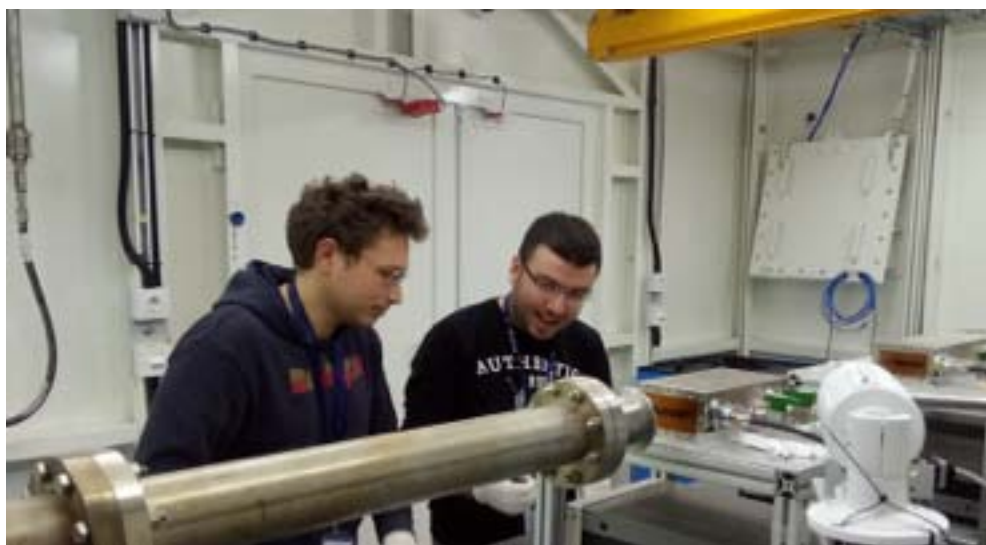


Exceptionally active and stable catalysts for CO₂ reforming of glycerol to syngas

S. Bac, Z. Say, Y. Kocak, K. E. Ercan, M. Harfouche, E. Ozensoy, A. K. Avci, *Applied Catalysis B: Environmental* (Submitted)

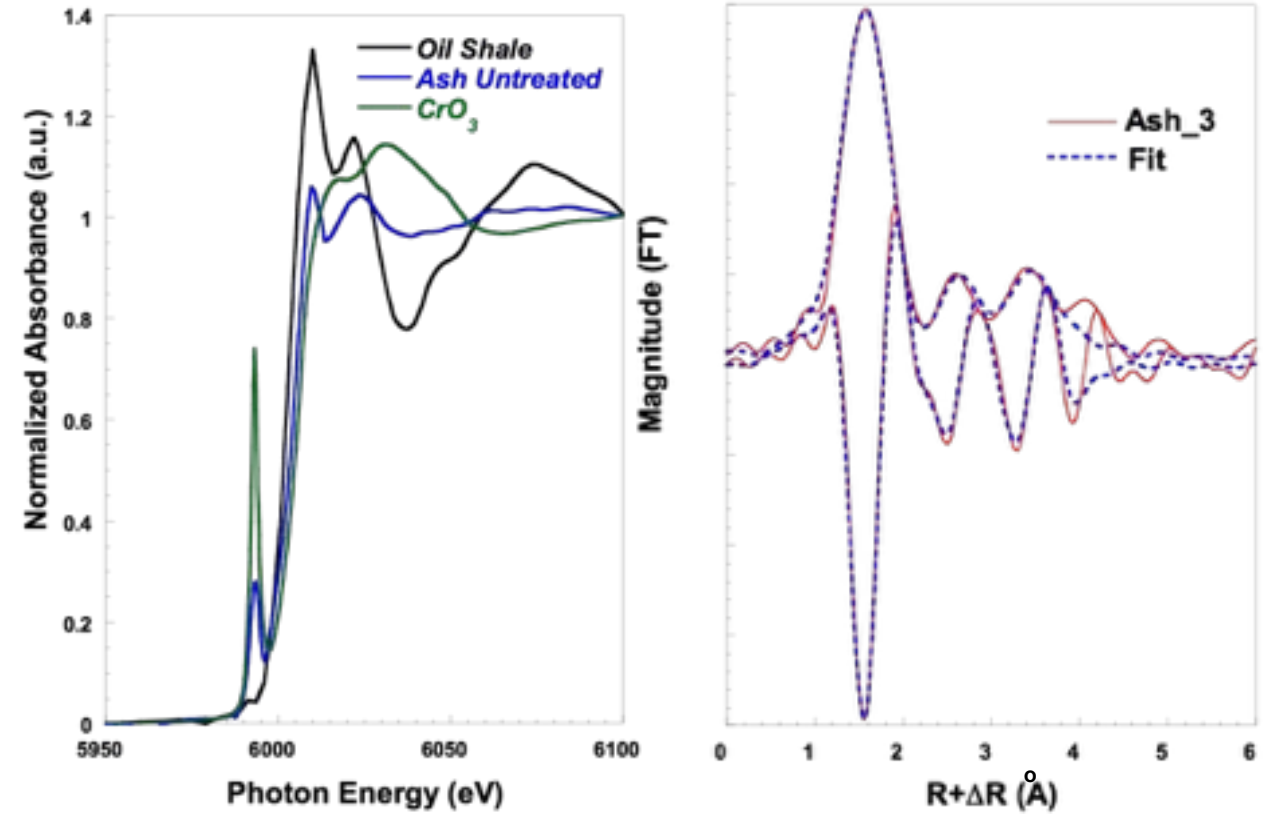
Turkey

Emrah Ozensoy's group



XAFS measurements of Cr V, and As within the various mixtures of oil shale ash solidifying additives

Jordan



Visit of **JAEC's Commissioner** & Chairman of the Jordanian National Committee of SESAME (**JNC**)

Ligand	N (atom)	R (Å)	σ^2 (Å ²)	ΔE (eV)
Cr-C	6.0	2.03	0.0002	4
Cr-Cr	0.7	2.72	0.003	
Cr-Cr	4.1	3.70	0.008	
Cr-C	4.2	3.9	0.008	

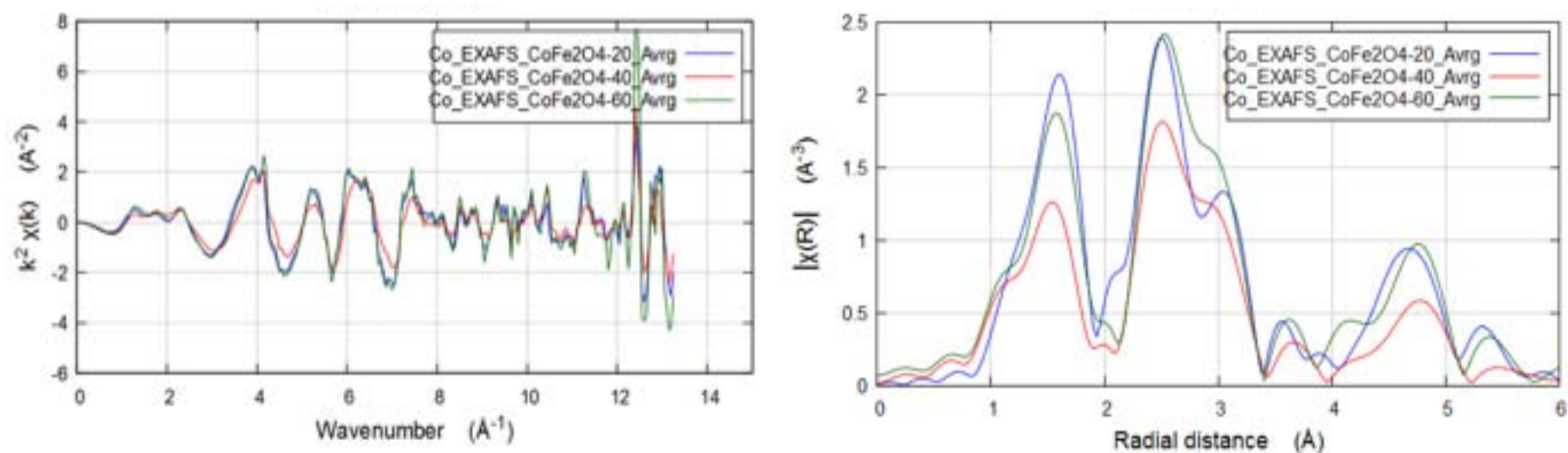
Probing the Local and Electronic Structure of Cobalt Ferrite Nanoparticles

Pakistan

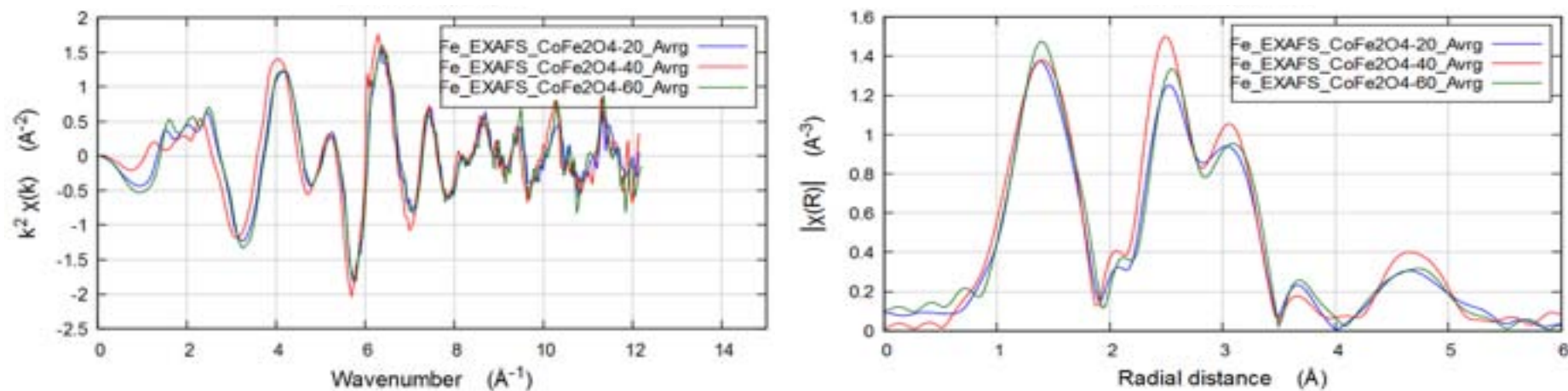


Dr. Shafqat and Dr. Maaz
at the experimental station
changing samples

Experimental EXAFS function and their Fourier Transform Measured at **Co K-edge**

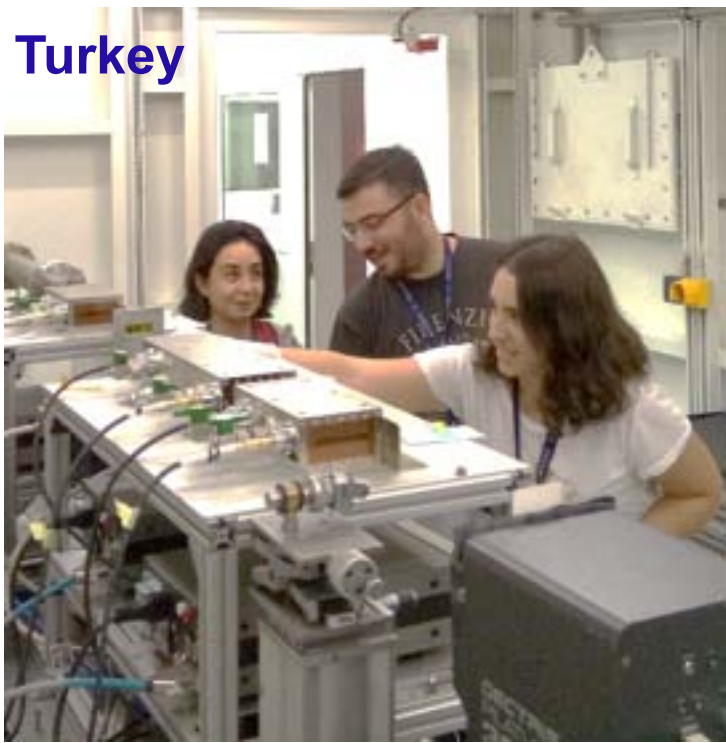


Experimental EXAFS function and their Fourier Transform Measured at **Fe K-edge**



Other Official Users (*XAFS/XRF*)

Turkey



Pakistan



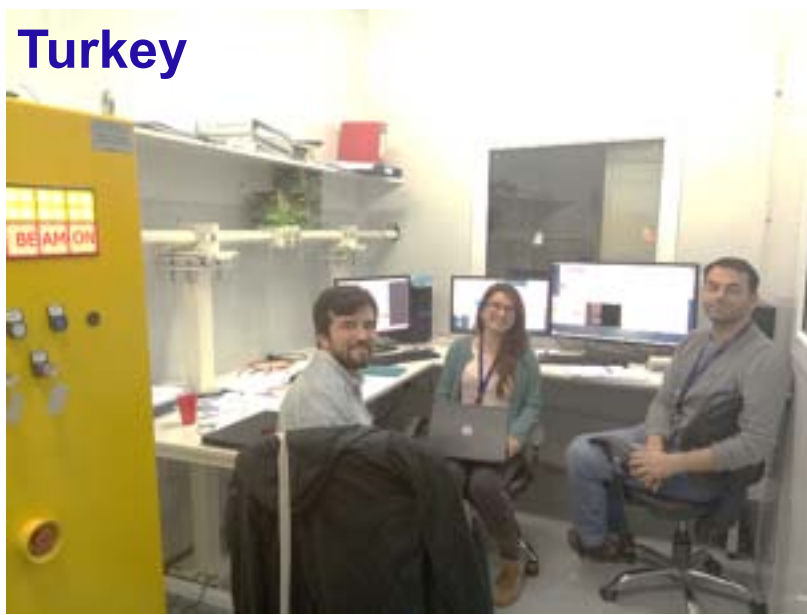
Pakistan



Pakistan

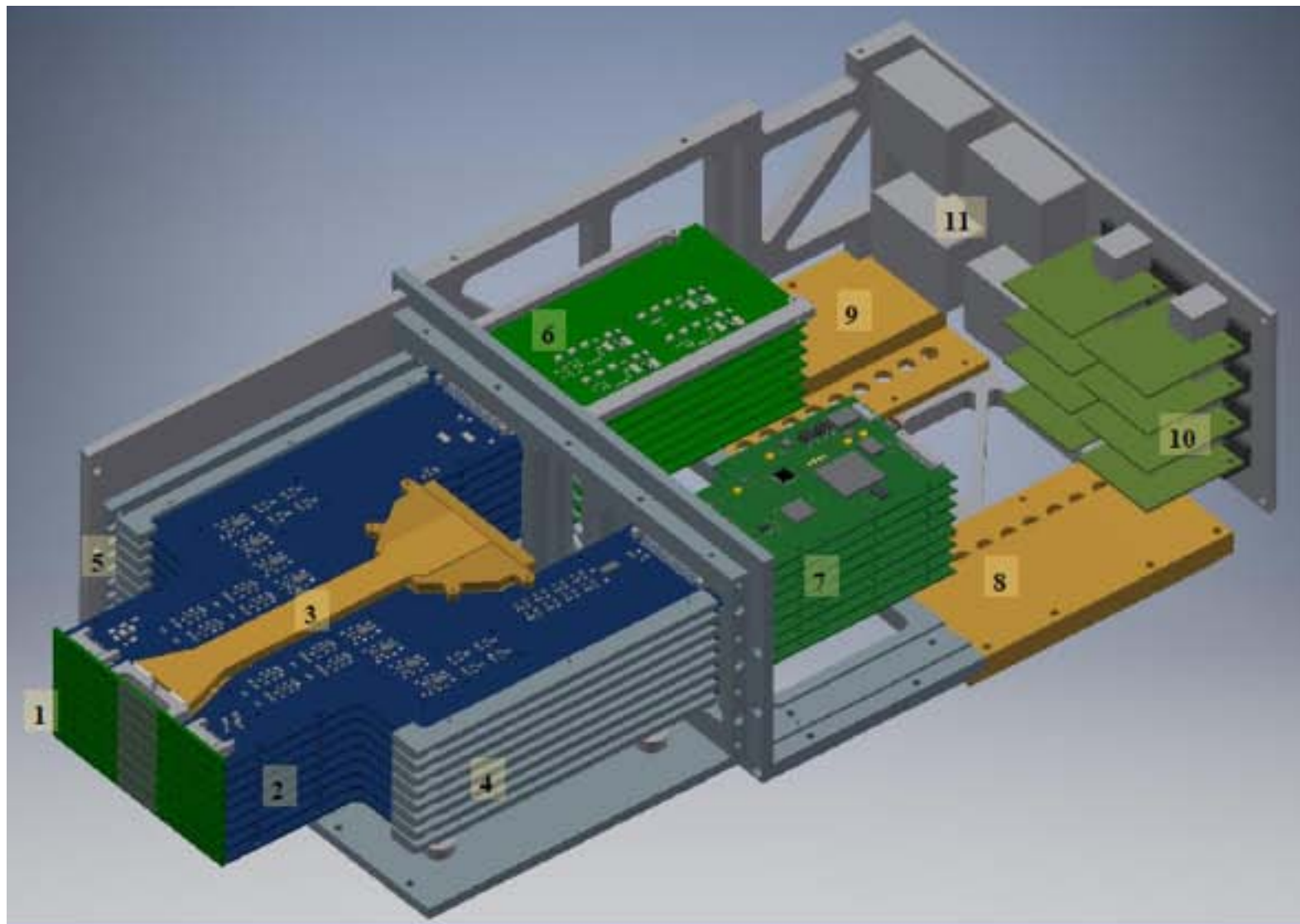


Turkey



XAFS/XRF Beamline

New Fluorescence detector

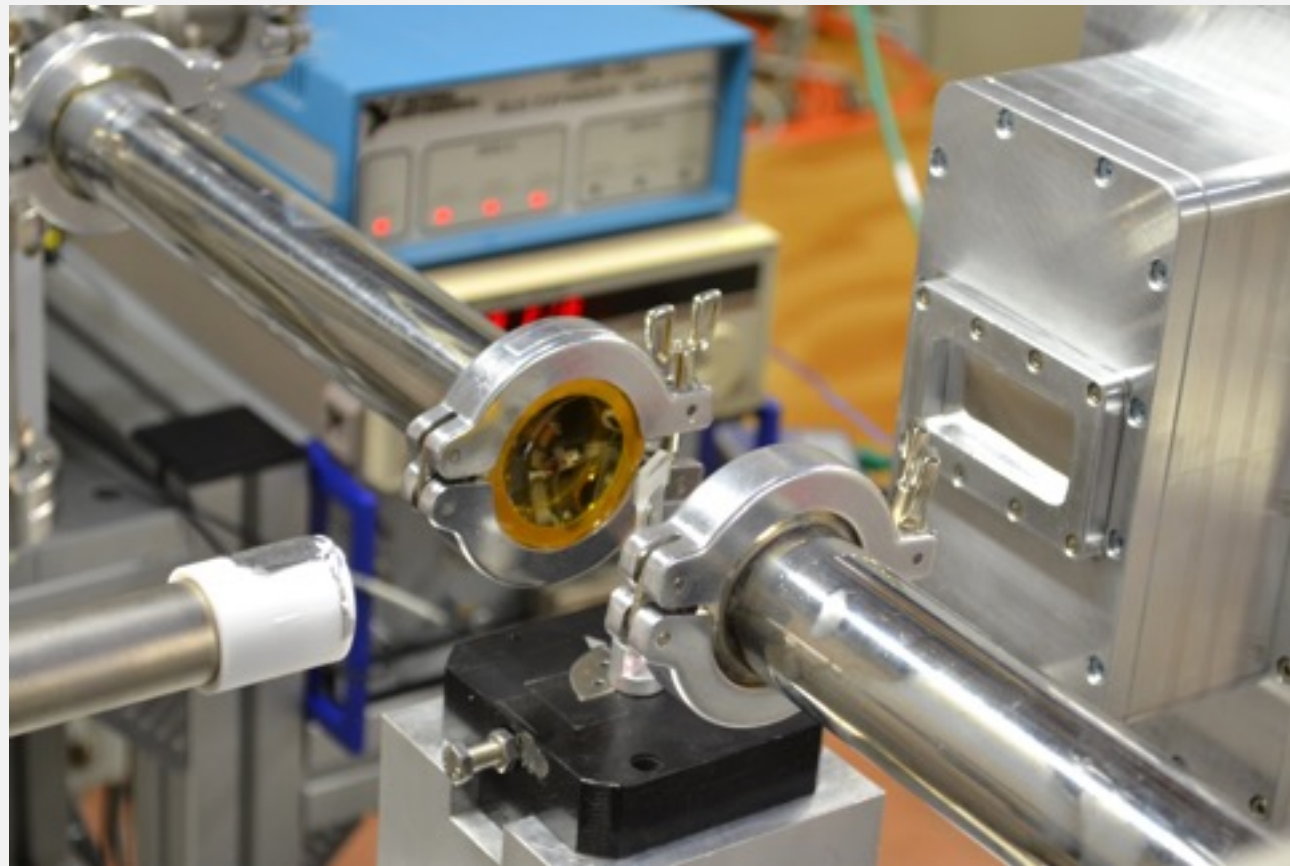


1. Front-end PCBs
2. Conditioning PCBs
3. Brass profile with cooling liquid flowing inside
4. Insertion guides at flanks of detecting heads
5. Rails for eight detection heads
6. Power supply and filters
7. Back-end PCBs
8. Inlet cooling distribution
9. Outlet cooling distribution
10. Ethernet PCBs
11. Power supply connectors

Courtesy of Daniela Cirrincione

Recent tests at Elettra confirmed the expected performance of the INFN SDD. The instrument will be installed at SESAME in May-June 2019

Position of detectors on XAFS beamline @ELETTRA



Detector in normal position

Detector in parasitic position



XAFS/XRF proposals evaluation

First external users in July 2018

Country	Submitted	Selected
CYPRUS	1	1
EGYPT	6	2
IRAN, ISLAMIC REPUBLIC OF	2	0
ITALY	1	0
JORDAN	2	1
KENYA	2	0
PAKISTAN	7	4
SWEDEN	1	0
TURKEY	14	11
TOTAL	36	19

Step by Step Assistance to Users

- Most of the Users are new to the XAFS techniques
- Users Need Assistance in all the Experimental Process

Analyzing data



Making plans & collecting good data



Mounting samples



Preparing Samples



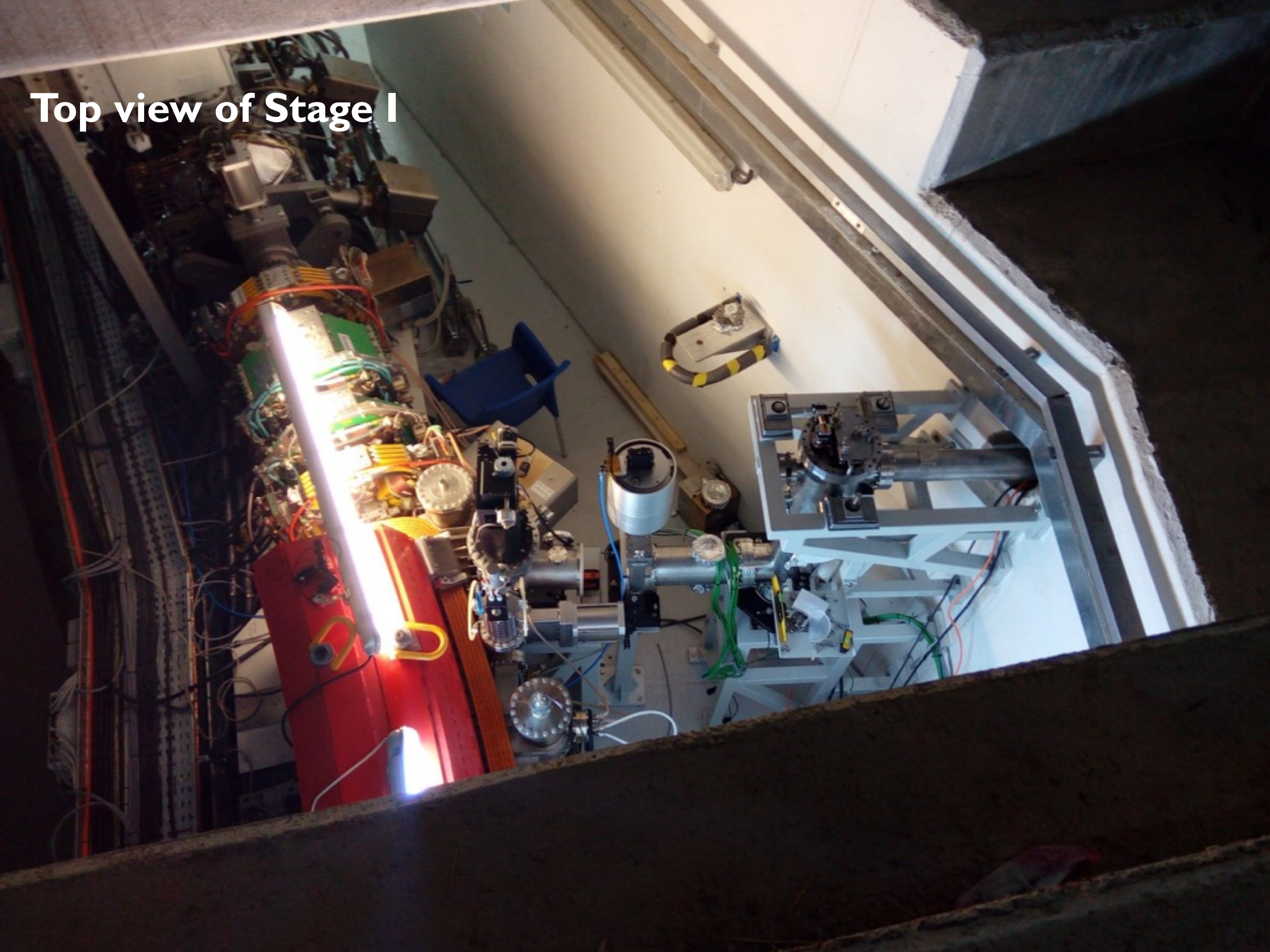
Collect less data but good ✓
Collect many and useless ✗

IR

IR

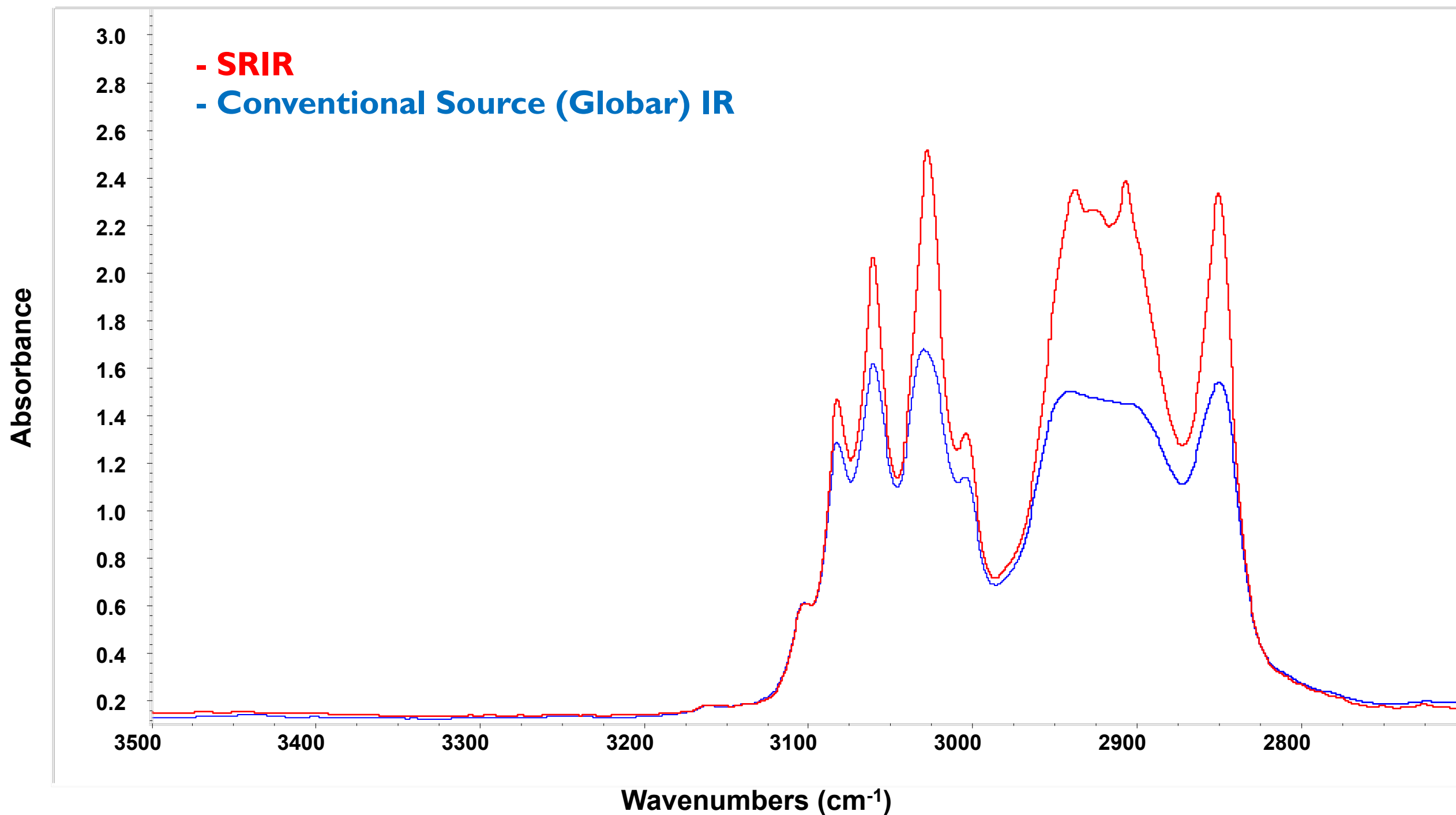
Hosting users since November 2018

Top view of Stage I



POLYSTYRENE 3 MIL STANDARD SAMPLE

Collection time: July 11, 2018



IR proposals evaluation

First external users in November 2018

Country	Submitted	Selected
COLOMBIA	1	1
CYPRUS	2	2
EGYPT	4	2
FRANCE	1	1
IRAN, ISLAMIC REPUBLIC OF	3	1
ITALY	1	1
JORDAN	2	1
PAKISTAN	4	0
PALESTINE	1	0
TOTAL	19	9



“Monitoring Stress Hormone Response after Radiation Exposure: IR Microspectroscopic Approach”

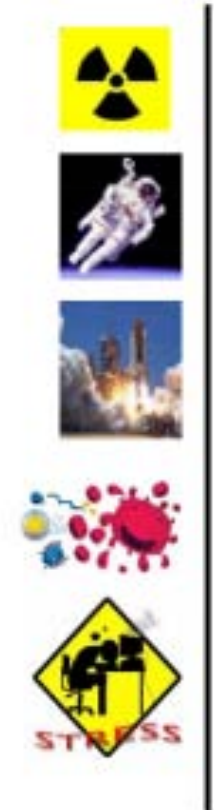
Mariangela Cestelli Guidi & Roberto Amendola
INFN/LNF and ENEA, Italy



**Beamtime: 14 shifts
4-8 November, 2018**

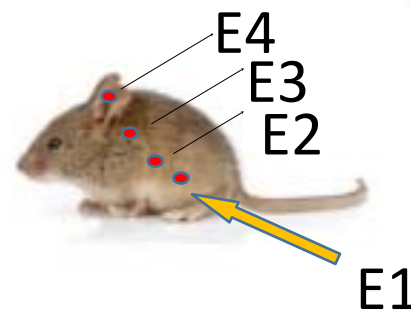


Stimulus



System 1, 2, 3, 4,

Response

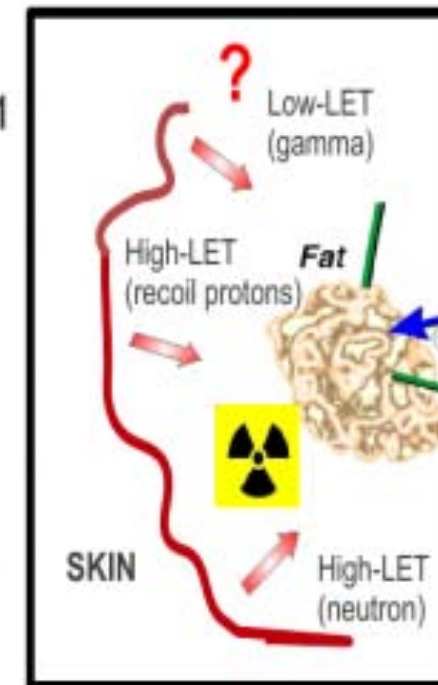


Stimulus 1



14 MeV Neutron

Stimulus 2, 3, ..., n



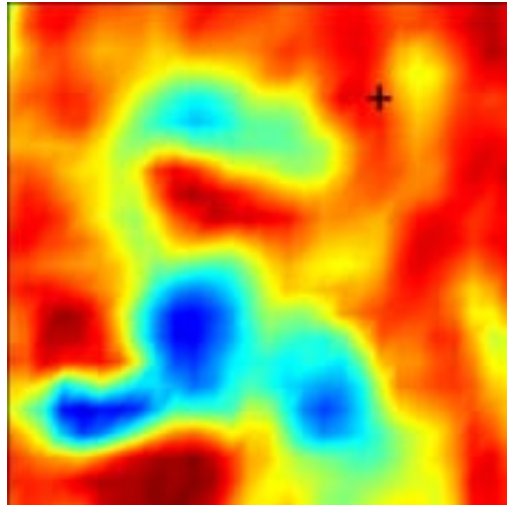
- Response 1: Skin self-renewal
- Response 2: Leptin Metabolism up-regulated
- Response 3: Fertility?, Energy Expenditure? Food intake?

Response ?

Holistic, Systemic Approach

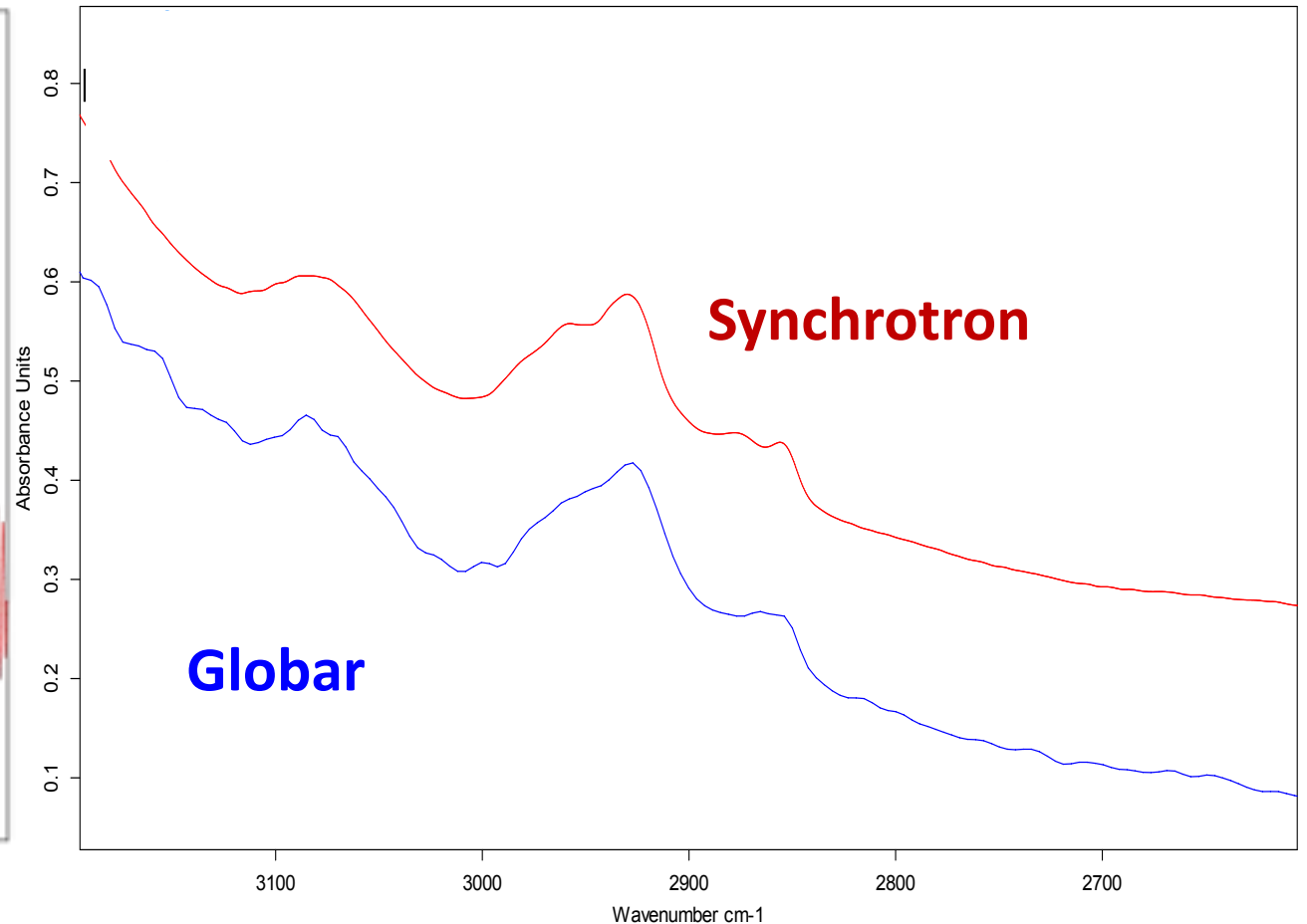
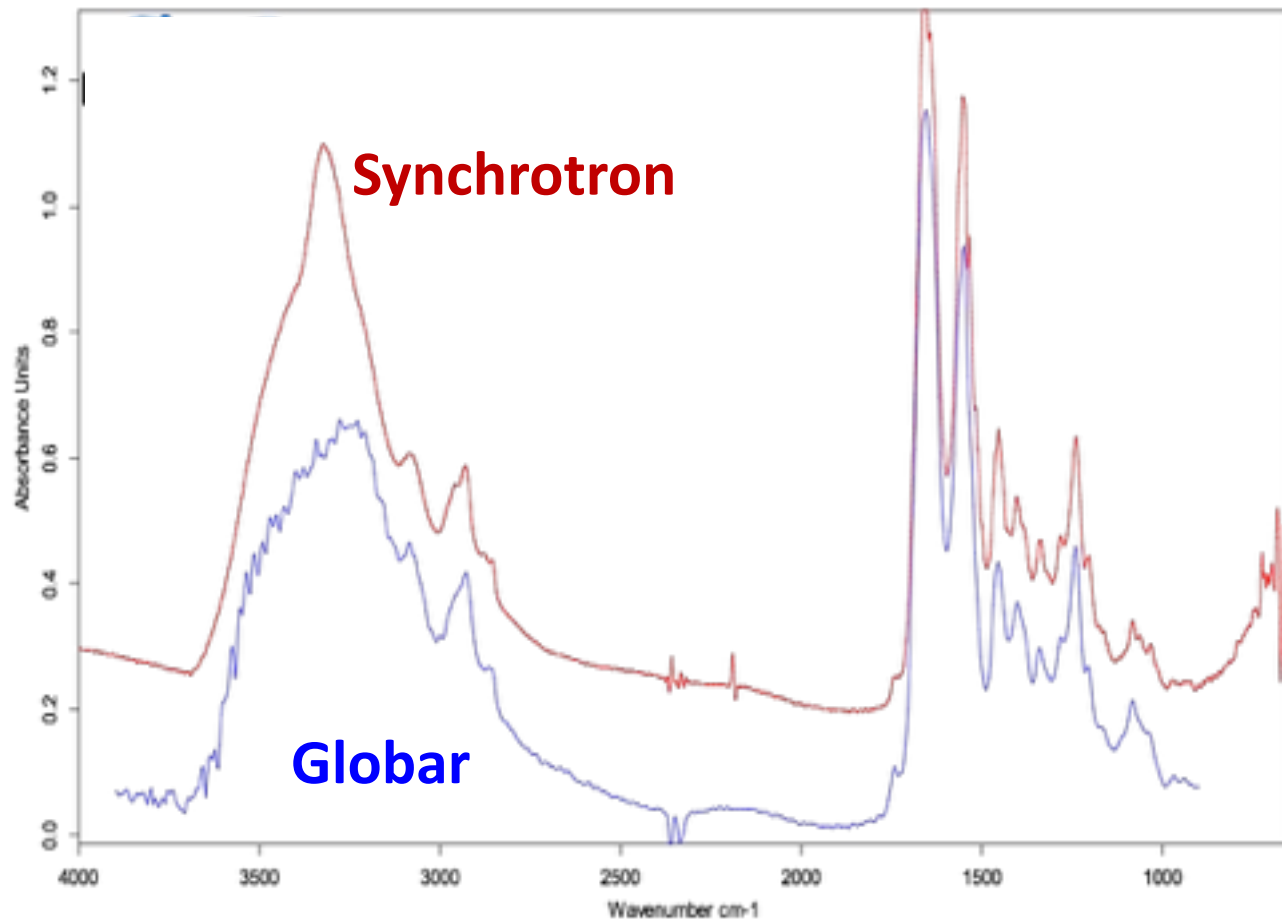
.....far more complex than expected.....

Preliminary Results - Data Analysis in progress



Synchrotron-IR chemical map

- Better Signal-to-noise ratio
- Higher sensitivity in the lipid region



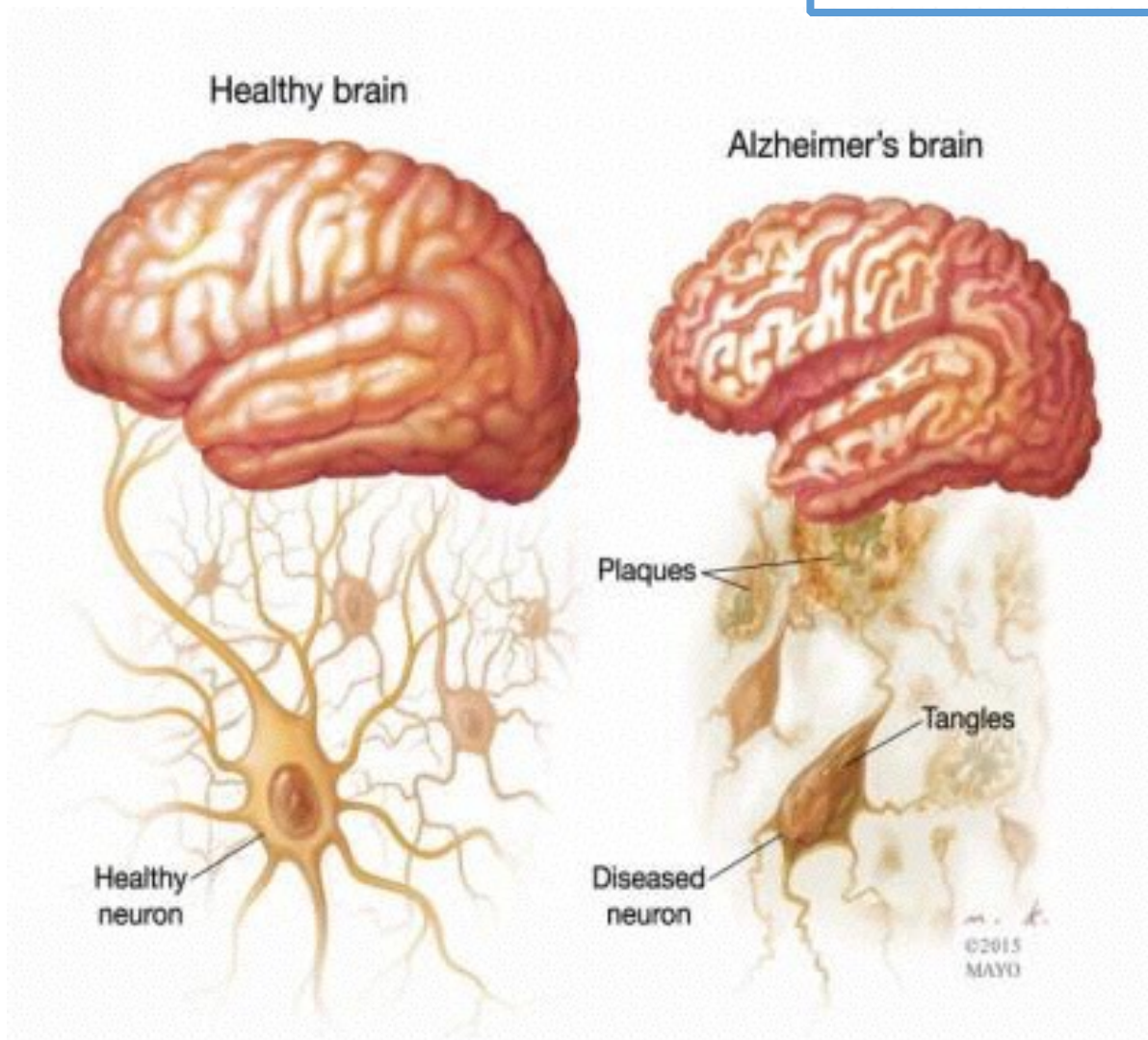


“Can Alzheimer's Disease be treated?”

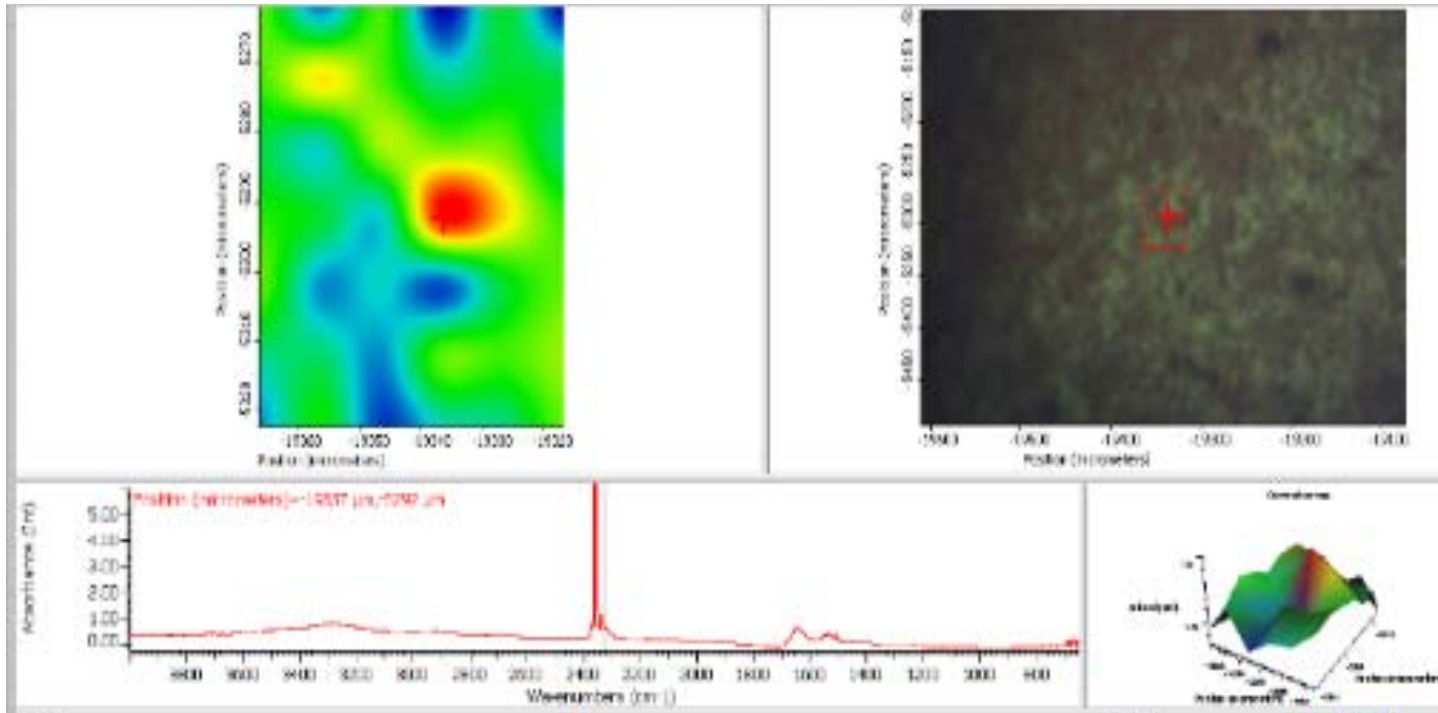
Gehan Ahmed & Safaa Khalil
National Research Centre, Egypt



Beamtime: 14 shifts
11-15 November, 2018



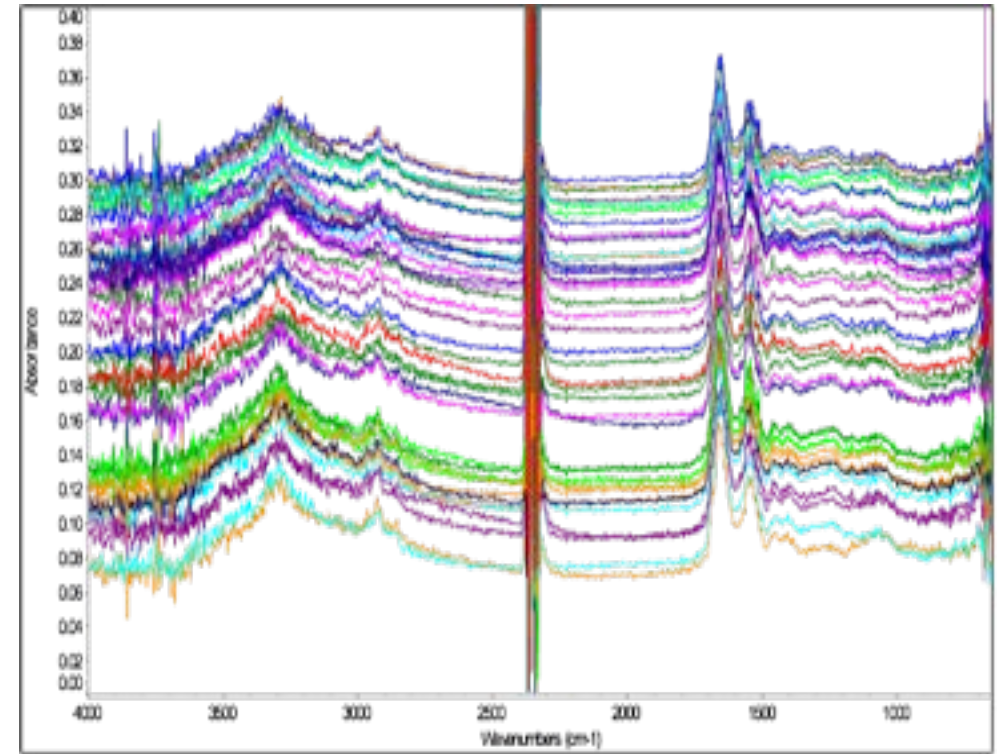
Preliminary Results - "deeper" Data Analysis is in progress



Membrane Lipids
CH 2810-3020cm⁻¹

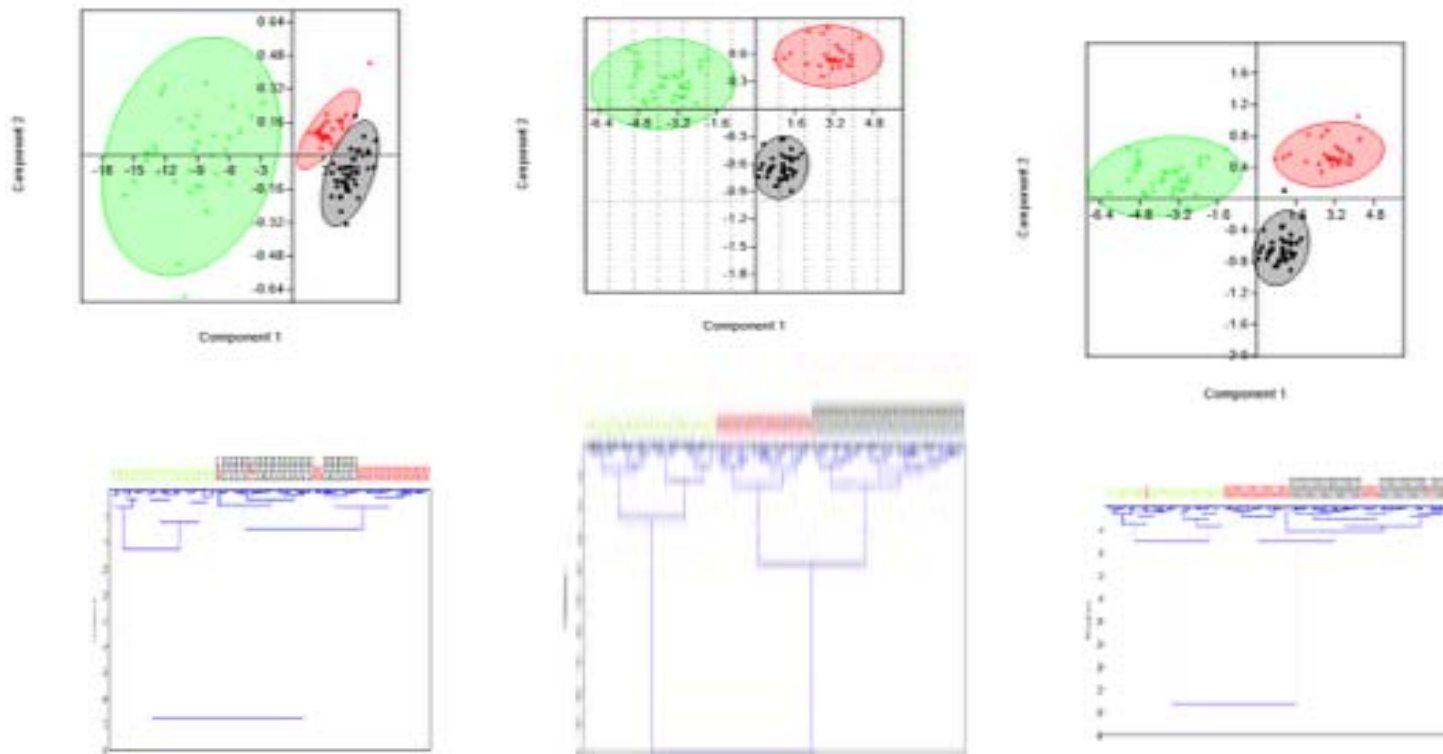
Amide I+ Amide II
1500-1700 cm⁻¹

Phosphate and Nucleic Acids
900-1300cm⁻¹



The results significantly showed:

- Very promising therapeutic effect on AD treatment
- Reducing/limiting the severe progression of AD-like in rat model.



PCA Analysis: Excellent separation of components

**A MANUSCRIPT TO BE
SUBMITTED IN MAY 2019**

“ FTIR Microspectroscopy analysis on historical parchment manuscript”

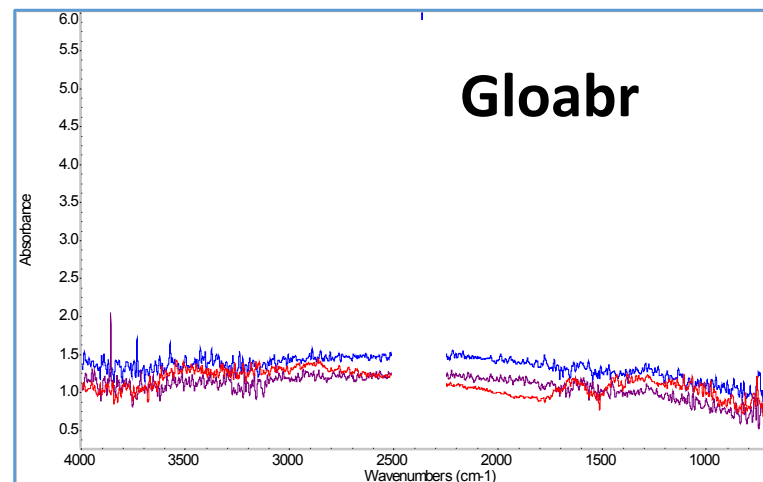
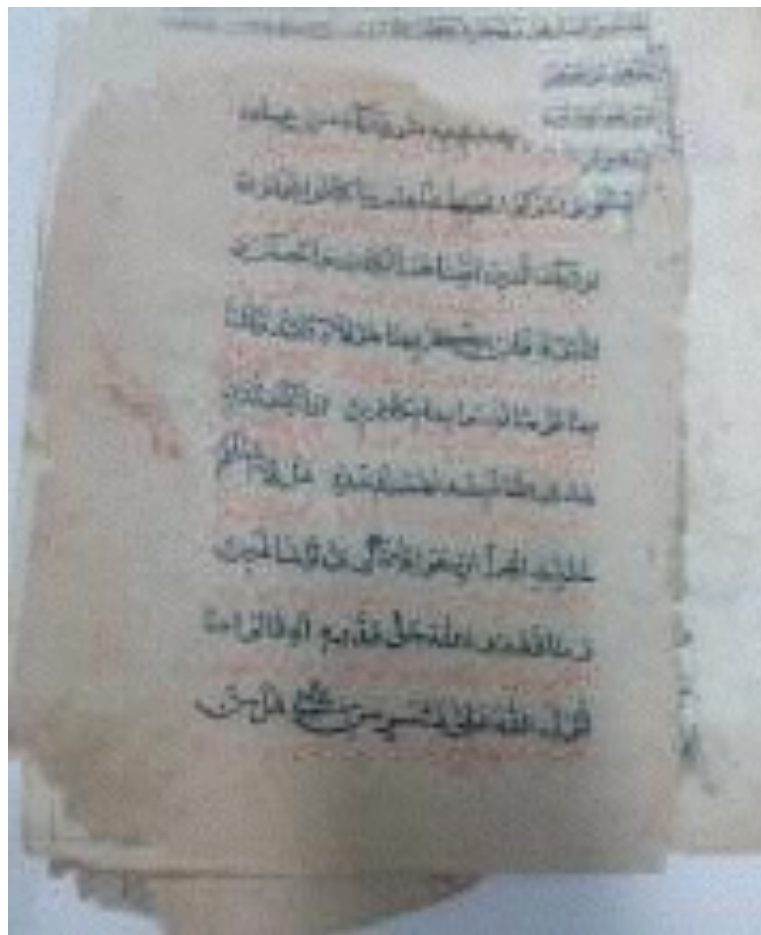
Maedeh Darzi & Victoria Beltran
Isfahan University of Technology, Iran,
and SOLEIL Synchrotron, France



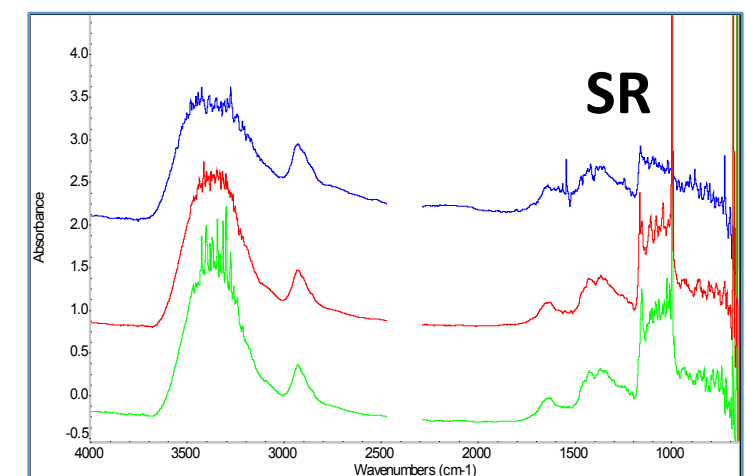
**A MANUSCRIPT TO BE SUBMITTED
BY JULY 2019**



**Proposal ID: 2010024
Beamtime: 8 shifts
11-13 December, 2018**



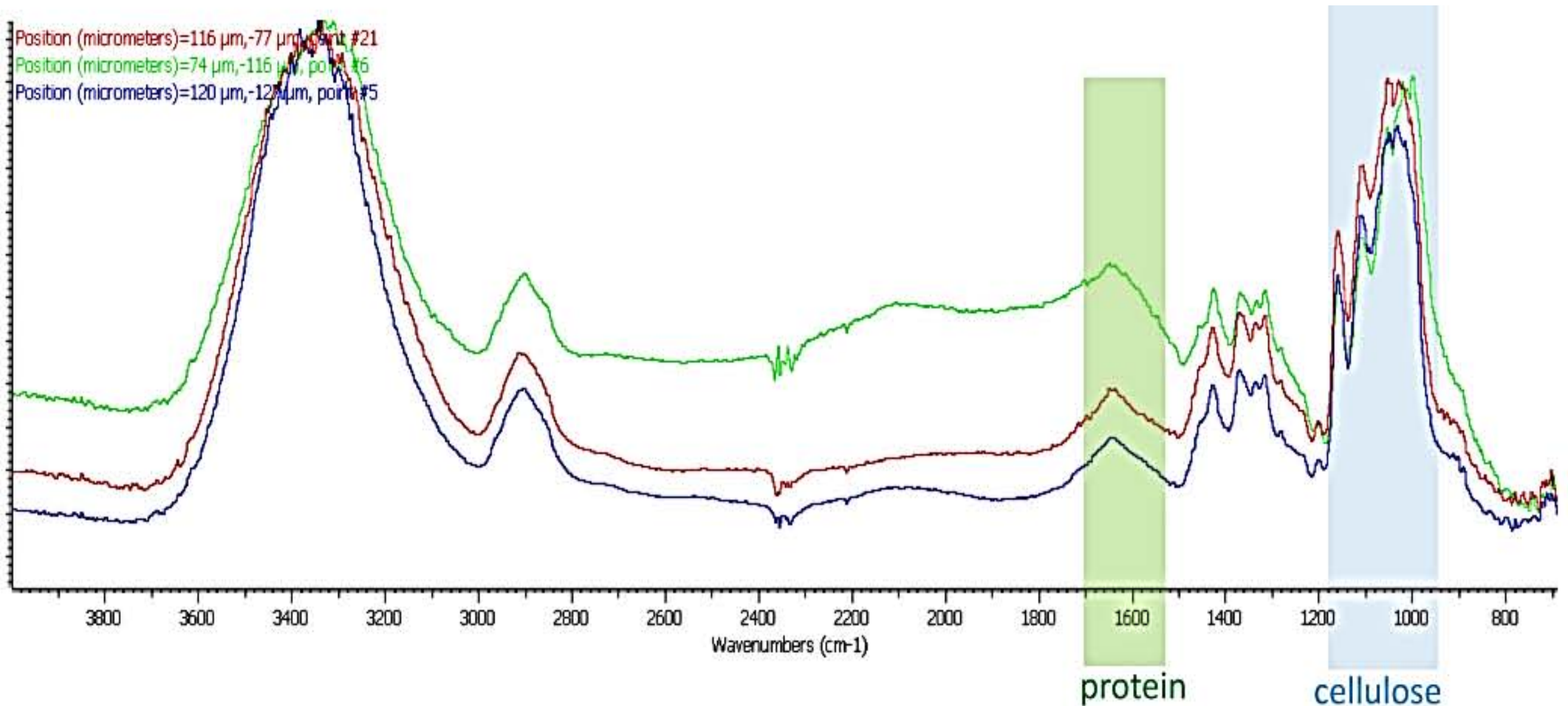
NO SIGNAL!



HIGH S/N RATIO

Characterization of the ancient papers' material

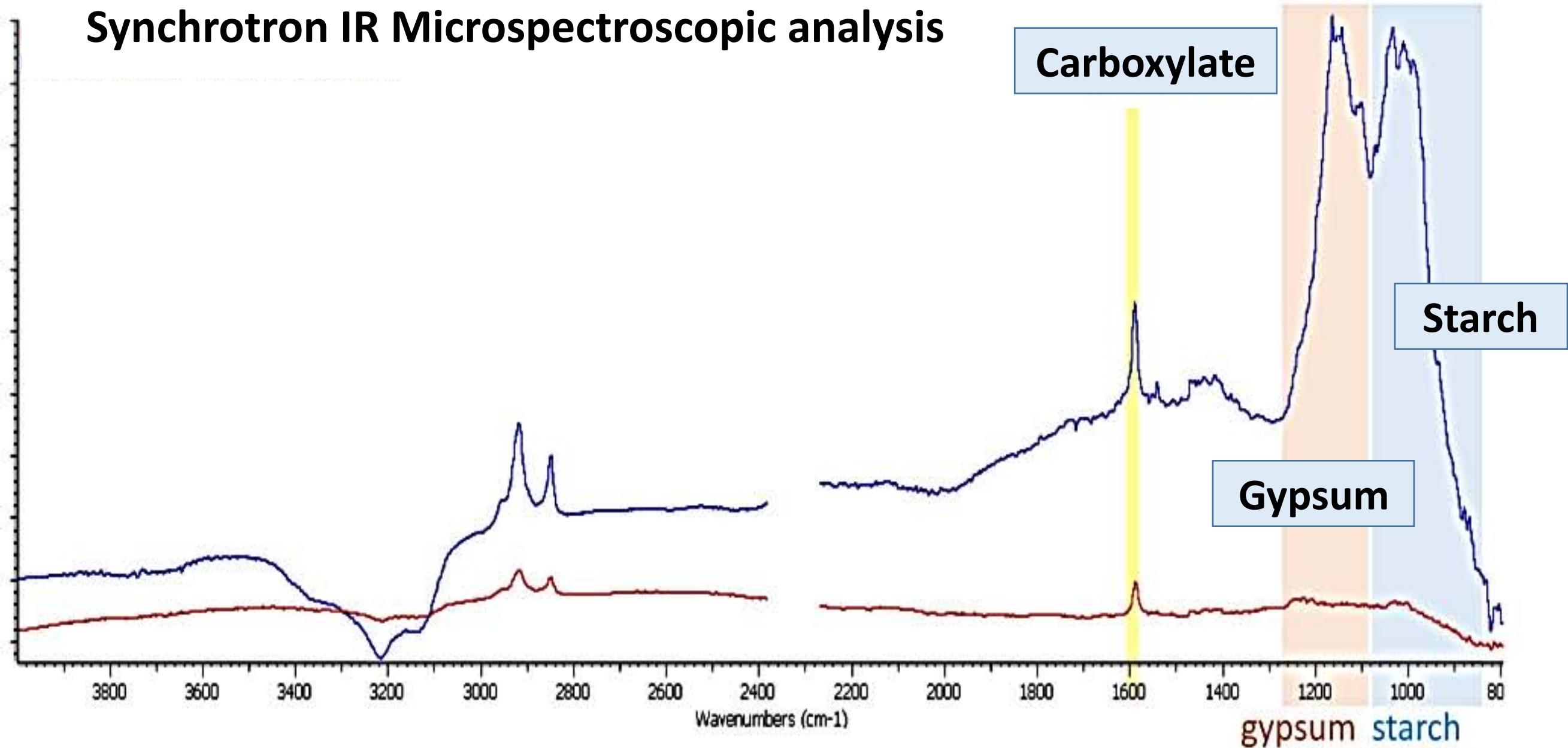
Synchrotron IR Microspectroscopic analysis



The presence of the proteins bands imply that the protein was not only used as the binder for the pigments but also as a materials that was applied to the surface of the paper

Characterization of pigments: Golden regions

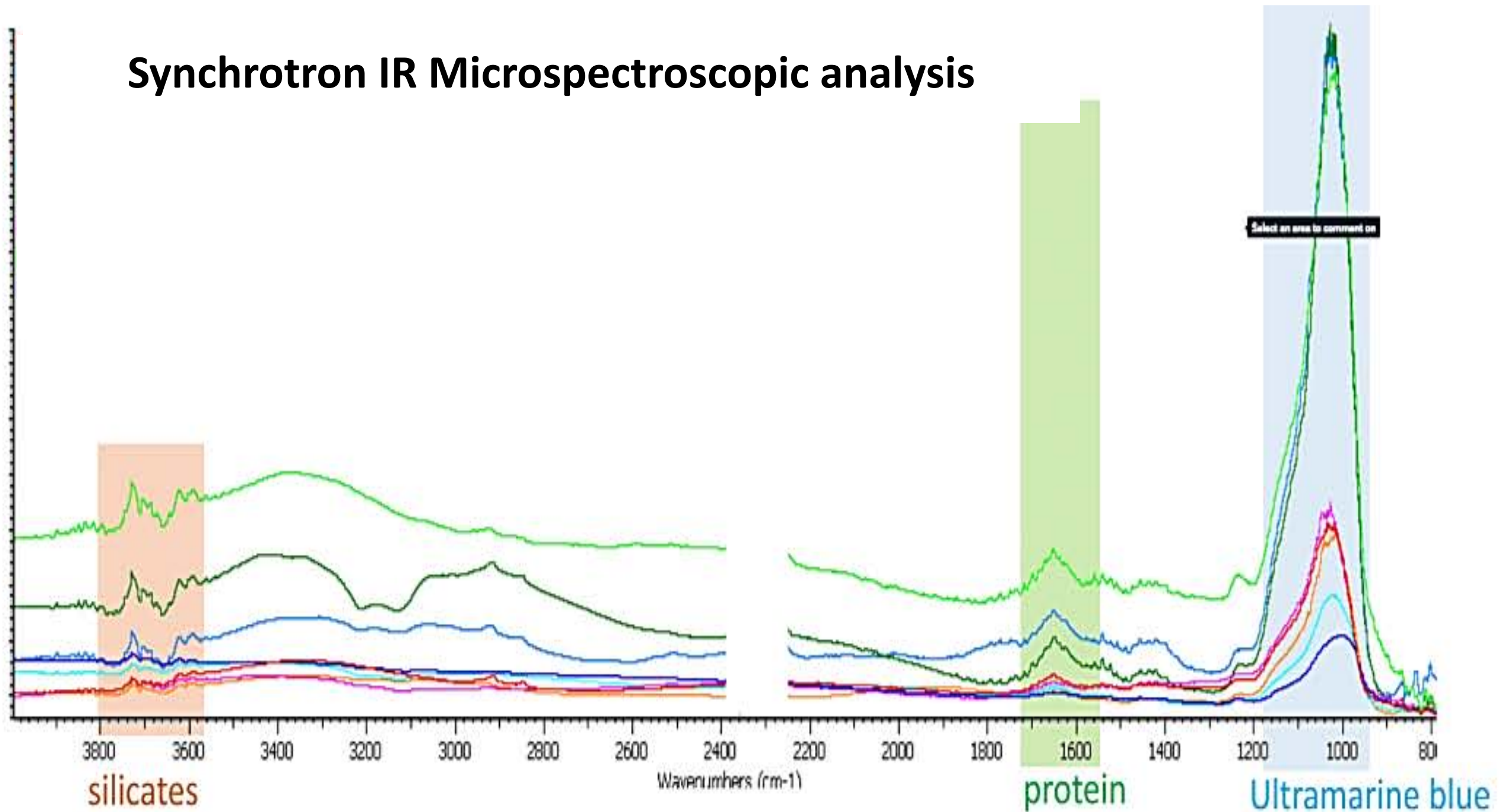
Synchrotron IR Microspectroscopic analysis



Presence of gypsum which could be used as a “filler” during the preparation process of the manuscripts

Characterization of pigments: Blue regions

Synchrotron IR Microspectroscopic analysis



Blue pigments could be identified as “ultramarine blue”, with some indications of the presence of protein and silicate bands

“Identification, characterisation, and exploration of diagenesis of ancient human bone from mortuary contexts in Eastern Mediterranean and the Near East”

Kirsi Lorentz and Simone Lemmers
The Cyprus Institute, Cyprus

**Proposal IDs: 20160030 and
20160063**
Beamtime: 14 shifts
16-20 December, 2018



stage 1
SOLEIL
• GLOBALAR
• SR-IR
• RAMAN



stage 2
SESAME
• GLOBALAR

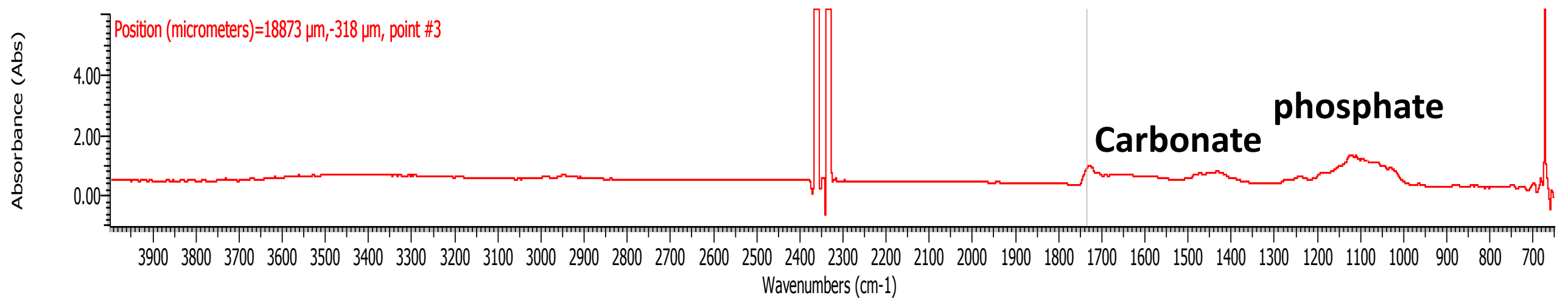
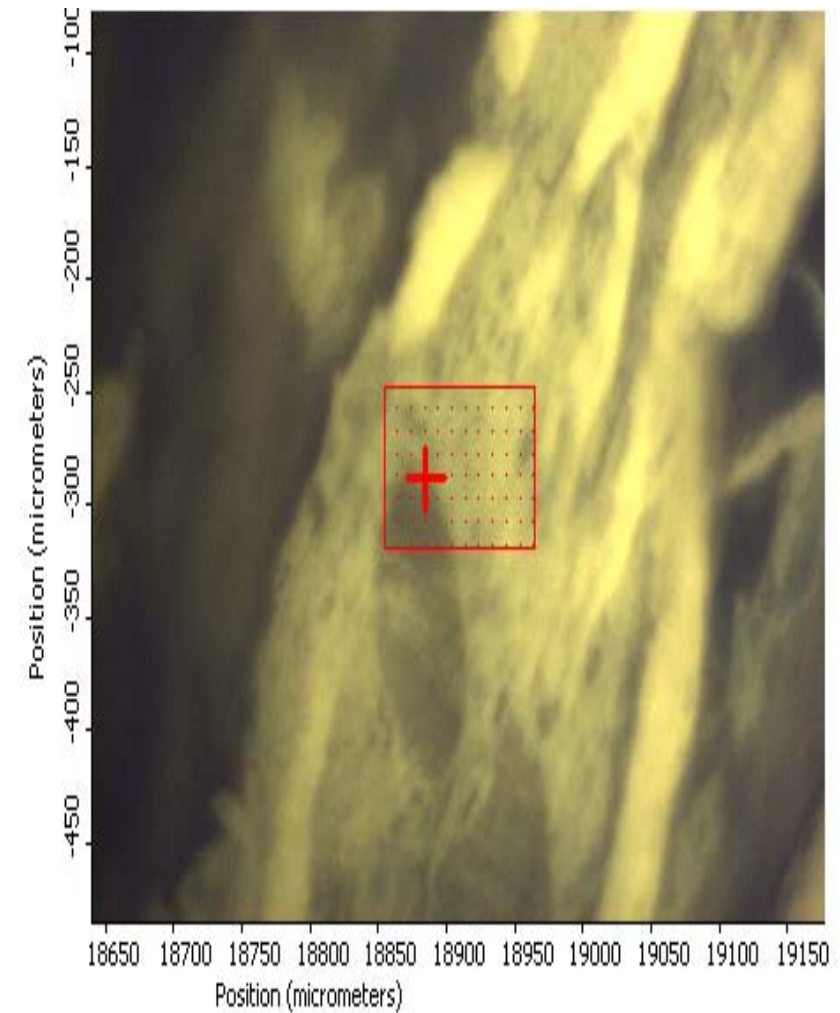
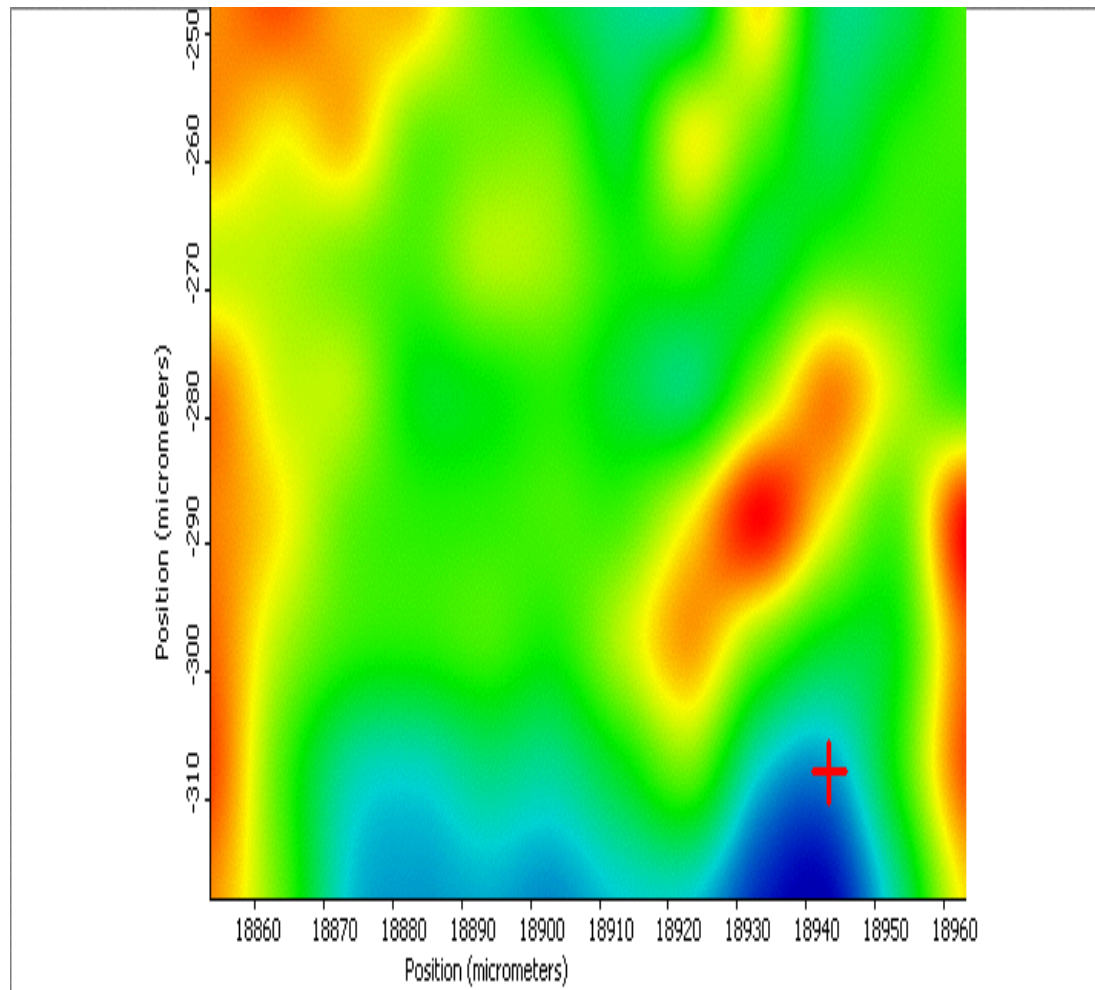


stage 3
SESAME
• SR-IR



Archaeological ancient human bone

A MANUSCRIPT IN PREPARATION



Data analysis in progress

Very low indication of occurring collagen bands

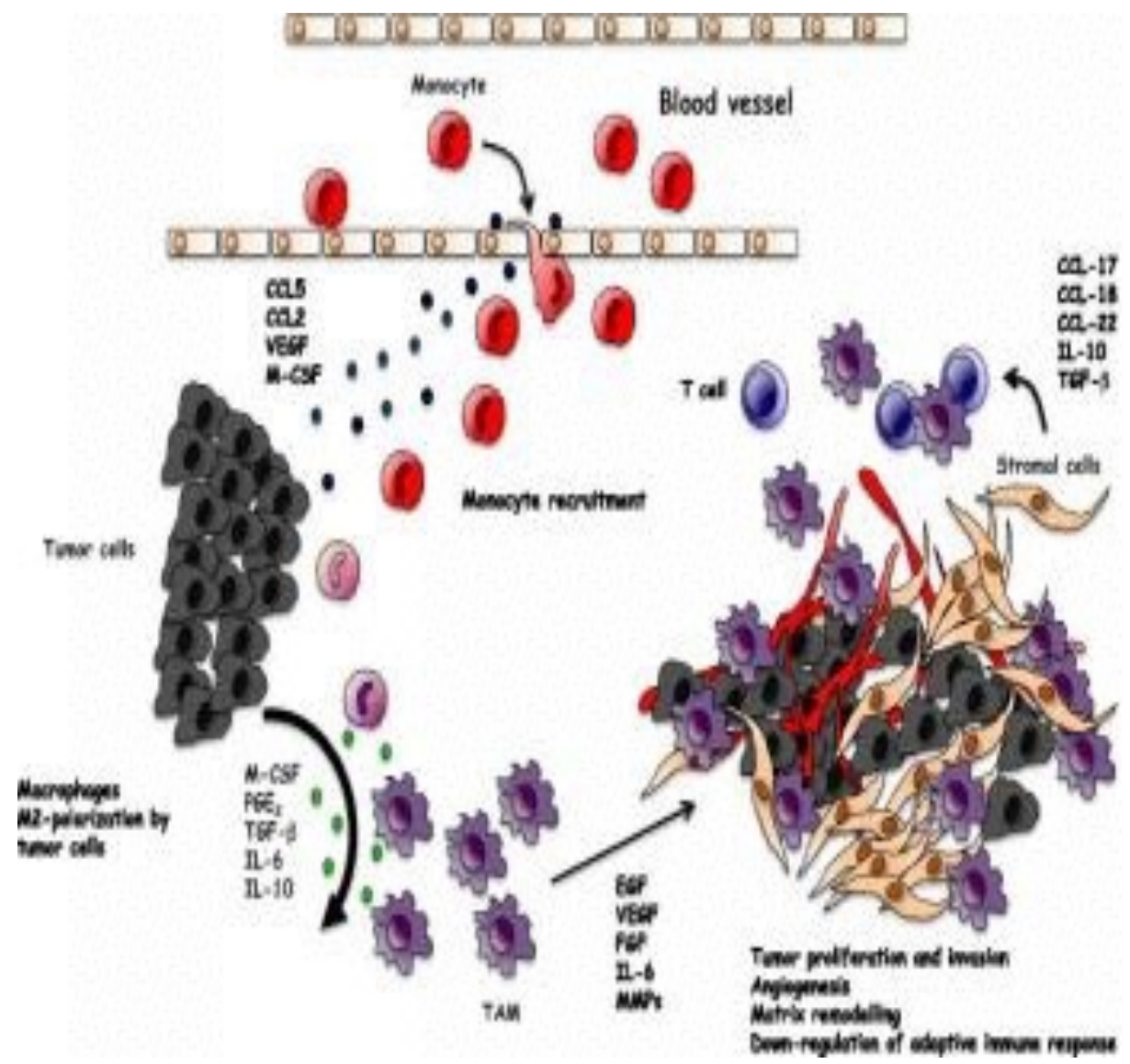
“Synchrotron IR Microspectroscopy: characterization of human monocytic cells stimulated by Syndecan-1 knockdown non-inflammatory and inflammatory breast cancer cell lines”



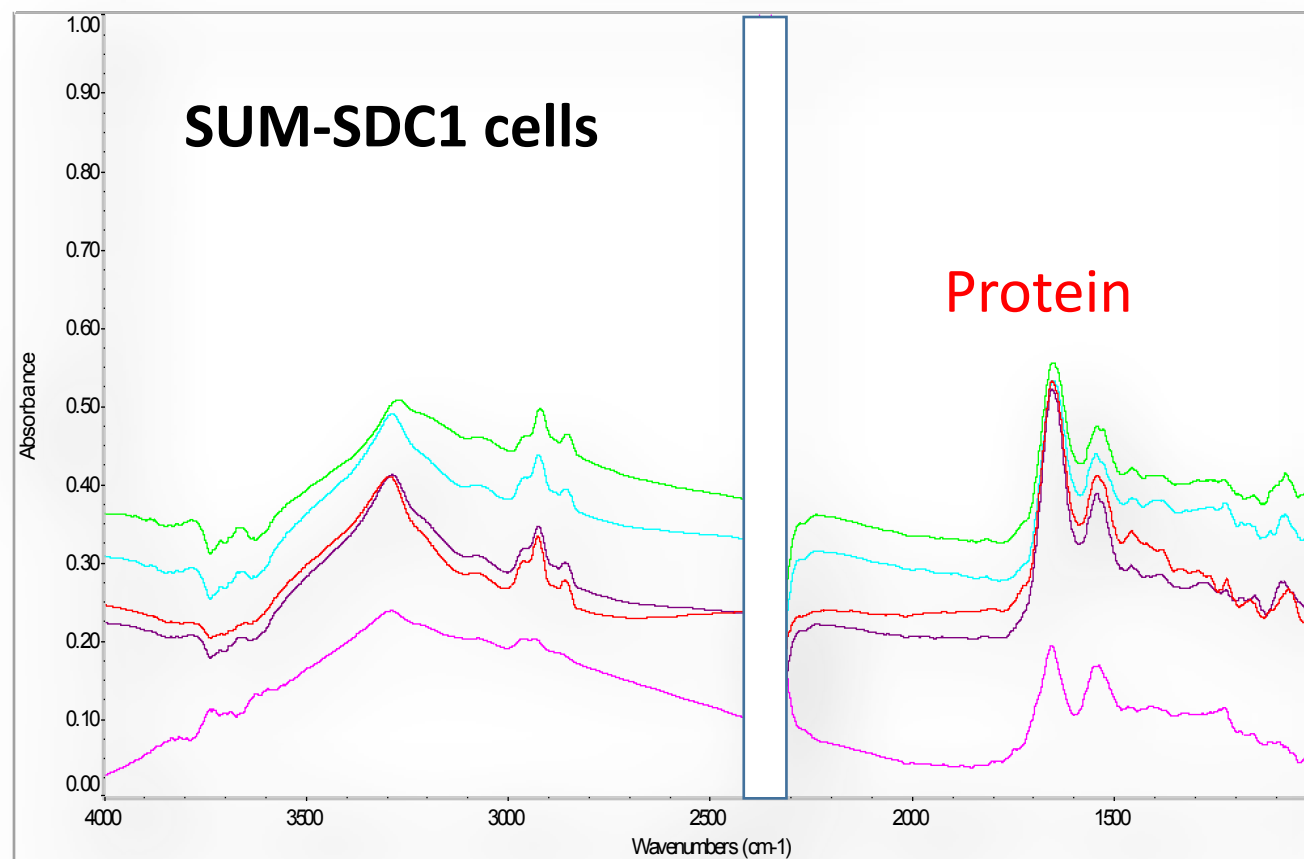
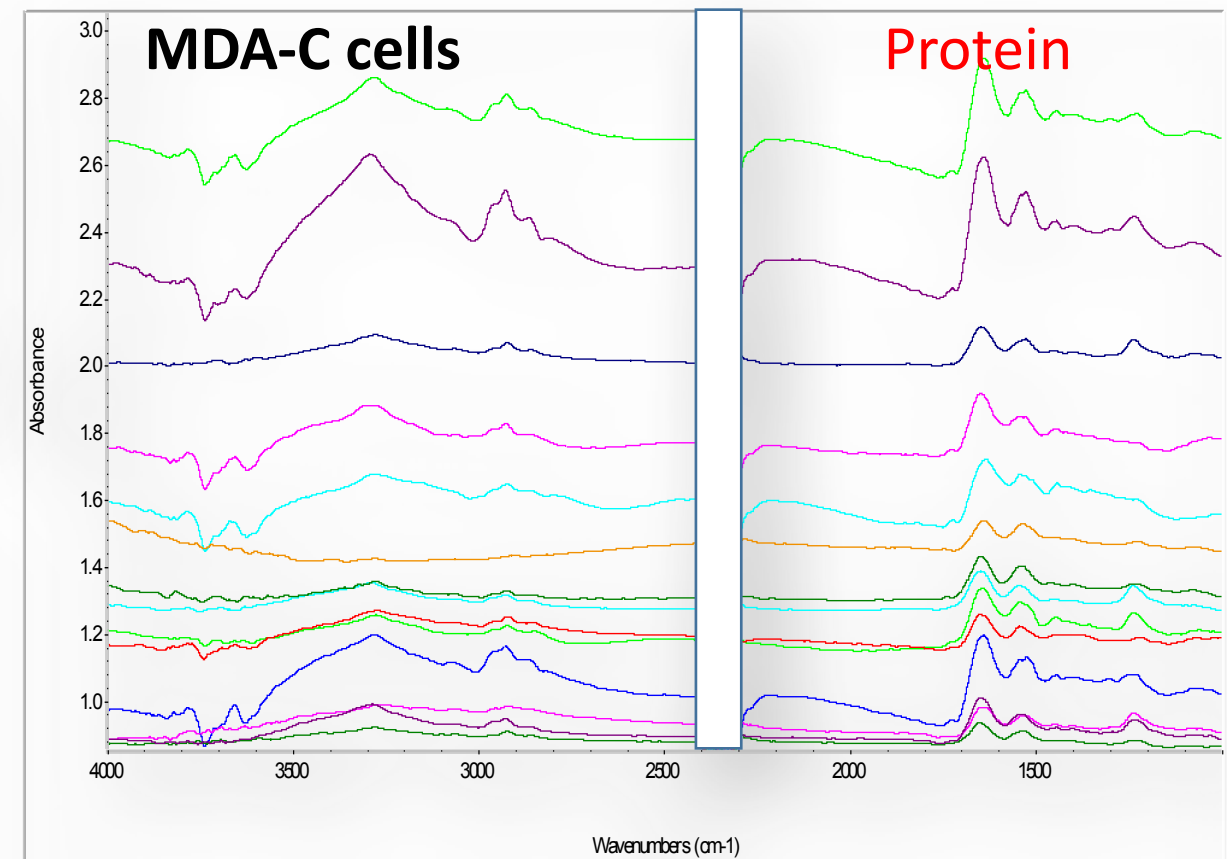
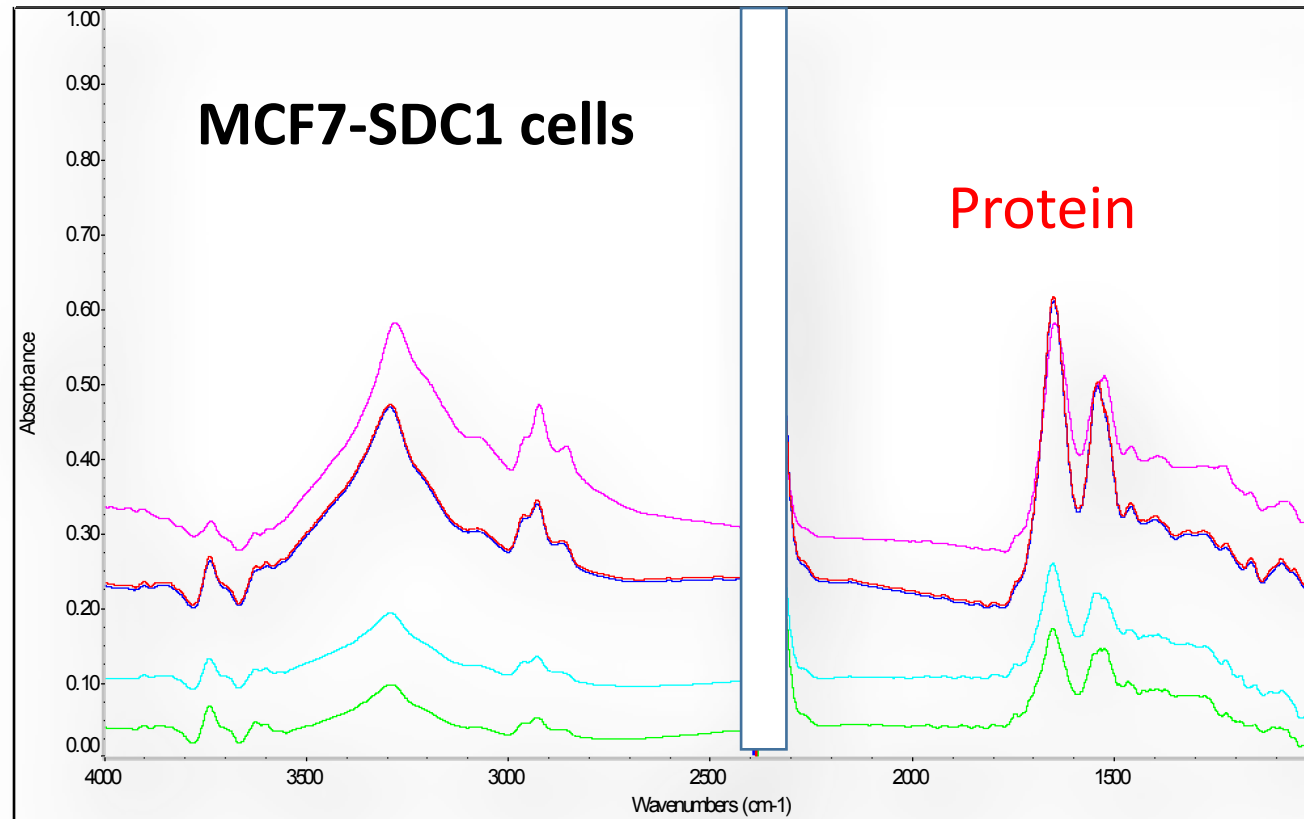
Cairo University

Hossam Taha & Noura El-Husseiny
National Research Centre, Egypt

Proposal ID: 20160044
Beamtime: 12 shifts
23-27 December, 2018



A MANUSCRIPT IN PREPARATION



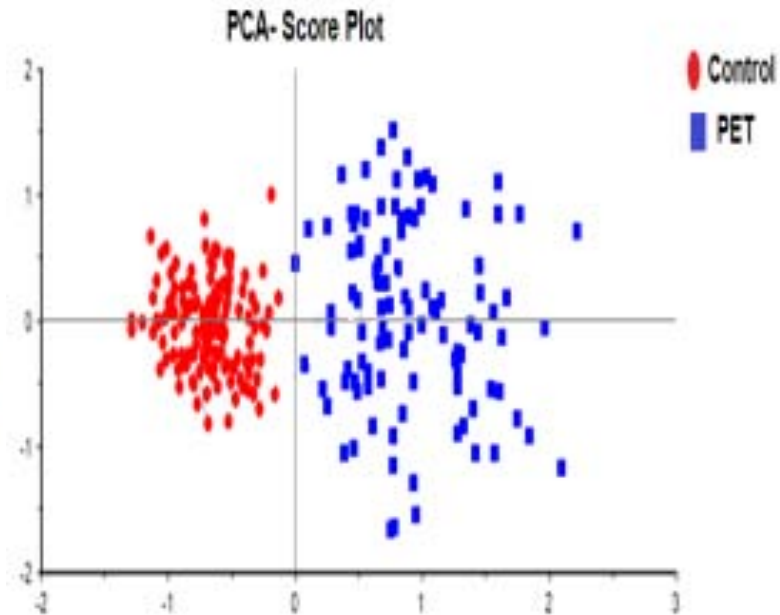
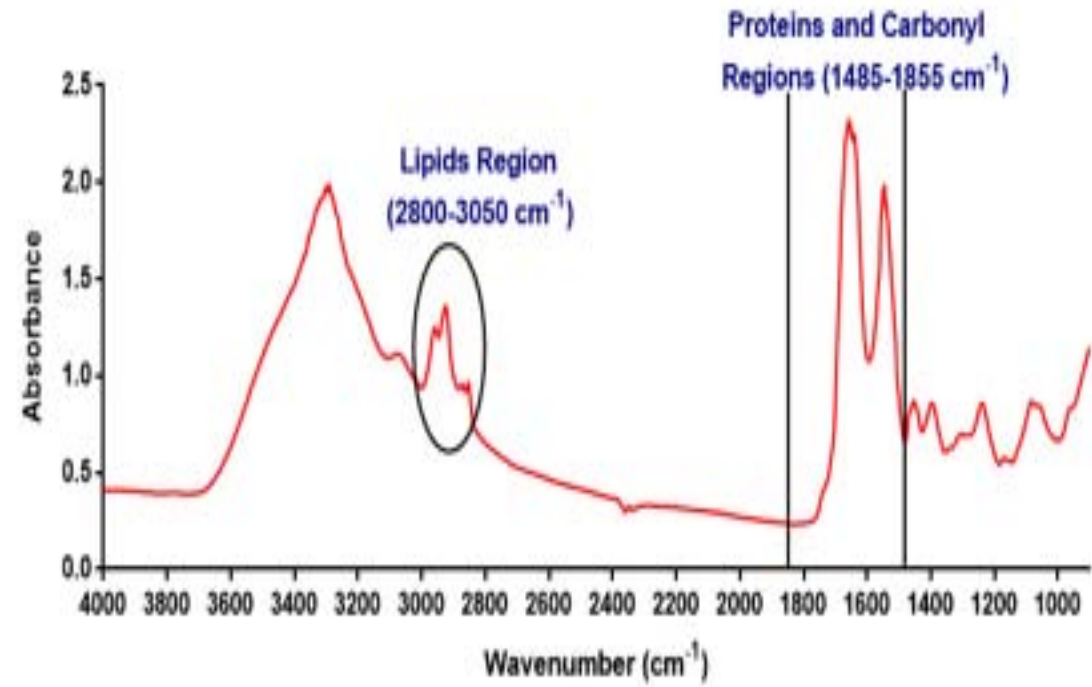
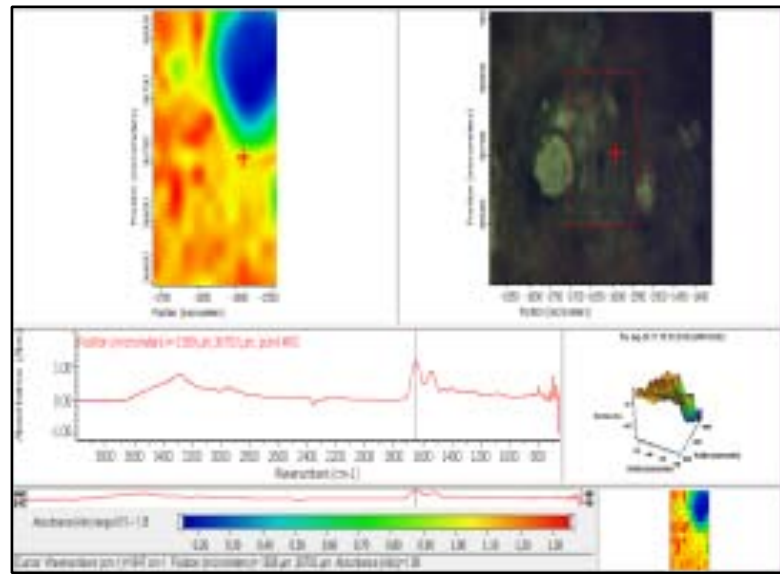
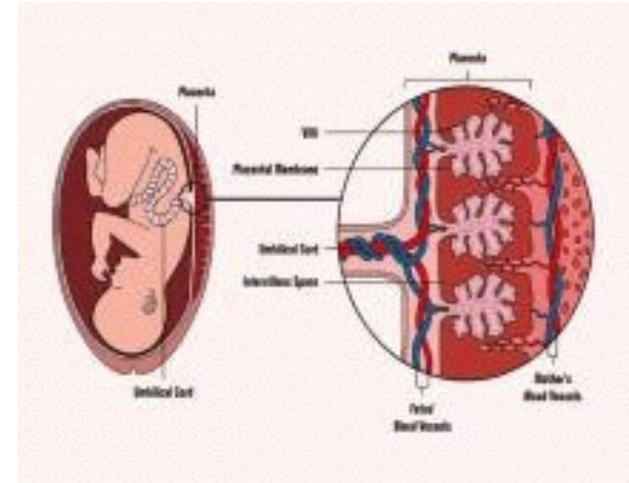
Raw data – data analysis is in progress

“IR Microspectroscopic Investigation of the Role of Placenta in the Pathogenesis of Preeclampsia”

Lina Dahabiya, Randa Mansour and Gihan Kamel
University of Jordan and SESAME



Research Collaboration (Global)
Starting Date: July, 2018



-> promising results and can enhance the current understanding of the underlying biochemical mechanisms of pre-eclampsia disease.

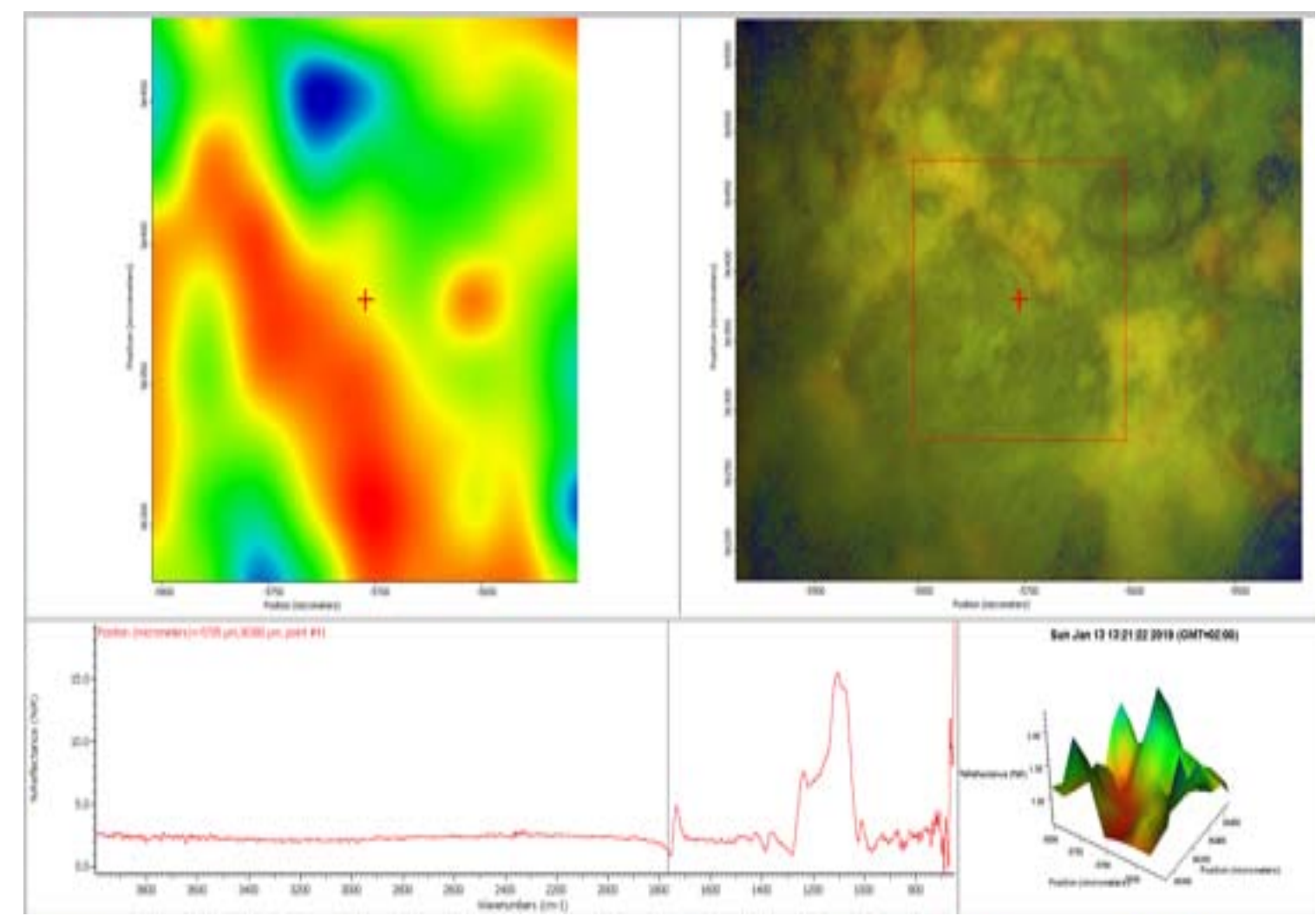


“Developing novel polymeric materials for cultural heritage preservation protocols - ancient bones”

Amr A. Abdelghany and Gihan Kamel
National Research Centre, Egypt and SESAME



Research Collaboration
Starting Date: October, 2018

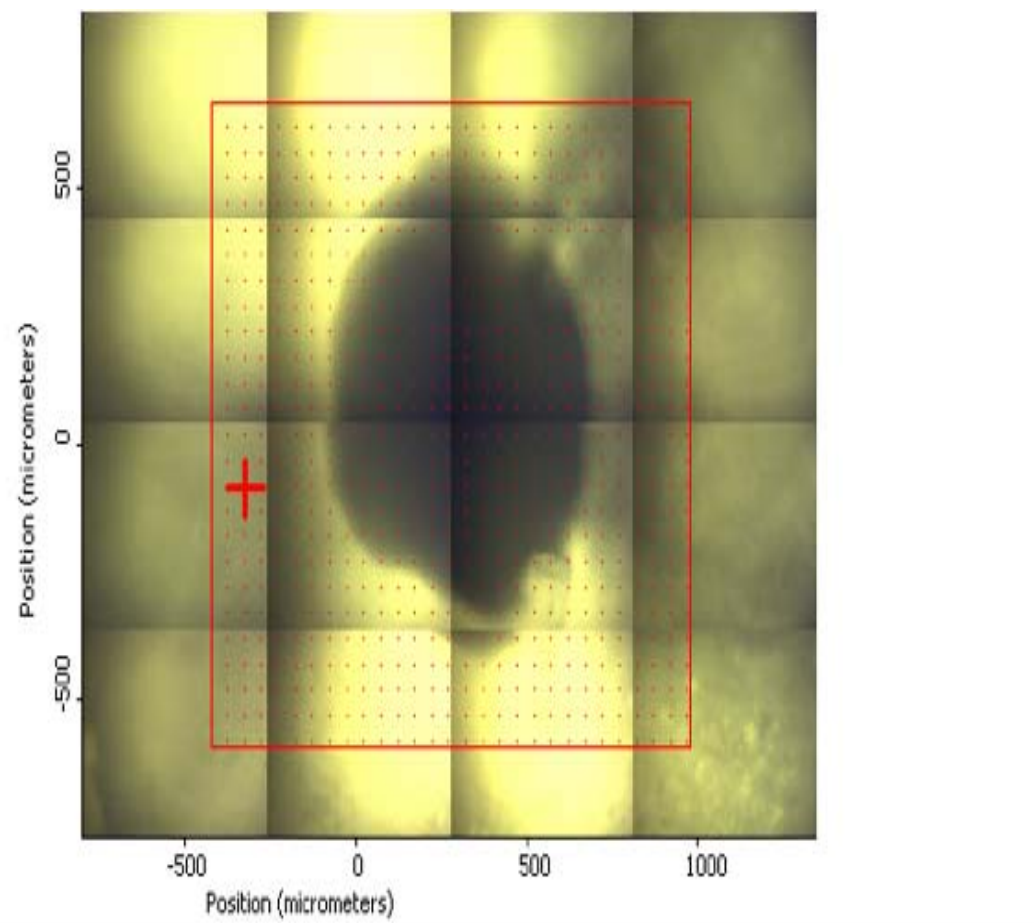


ON GOING EXPERIMENTS

“Effect of sodium hypochlorite and non-setting calcium hydroxide on chemical structure of radicular dentin.”

Hamza Saoud

Jordan University of Science and Technology (JUST)



Collaboration on Global

ON GOING EXPERIMENTS

Modern human tooth section

Proposals are evaluated by International experts:

- Sofia Diaz-Moreno (DIAMOND, XAFS/XRF)
- Tom Ellis (Un. of Saskatchewan, IR)
- **Samar Hasnain (Un. of Liverpool, XAFS/XRF), Chair**
- Carol Hirschmugl (Un. of Wisconsin, IR)
- Bruce Ravel (NIST@NSLS-II, XAFS/XRF)
- Lisa Vaccari (Elettra, IR)



Second call for proposals

Deadline Autumn 2018



Second call for proposals

Deadline Autumn 2018

Affiliation Country	IR	XAFS/XRF	Total
CYPRUS	4	1	5
EGYPT	17	13	30
GERMANY	1	1	2
IRAN, ISLAMIC REPUBLIC OF	4	8	12
ISRAEL	0	4	4
ITALY	0	2	2
JORDAN	9	6	15
MEXICO	0	1	1
PAKISTAN	5	15	20
TURKEY	3	9	12
Total	43	60	103



Second call for proposals: Evaluations (11-3-2019)

Affiliation Country	IR: submitted	IR: selected
<i>CYPRUS</i>	<i>4</i>	<i>3</i>
<i>EGYPT</i>	<i>17</i>	<i>8</i>
<i>GERMANY</i>	<i>1</i>	<i>1</i>
<i>IRAN, ISLAMIC REPUBLIC OF</i>	<i>4</i>	<i>3</i>
<i>JORDAN</i>	<i>9</i>	<i>5</i>
<i>PAKISTAN</i>	<i>5</i>	<i>0</i>
<i>TURKEY</i>	<i>3</i>	<i>2</i>
<i>Total</i>	<i>43</i>	<i>22</i>



Second call for proposals: Evaluations (11-3-2019)

Affiliation Country	XAFS/XRF: submitted	XAFS/XRF: selected
CYPRUS	1	1
EGYPT	13	4
GERMANY	1	0
IRAN, ISLAMIC REPUBLIC OF	8	2
ISRAEL	4	3
ITALY	2	2
JORDAN	6	1
MEXICO	1	1
PAKISTAN	15	13
TURKEY	9	8
Total	60	35



SESAME

Calendar of operations 2019

2019 SESAME beam-time Schedule																										
	January		February		March		April		May		June		July		August		September		October		November		December			
	date	M	L	N	W	date	M	L	N	W	date	M	L	N	W	date	M	L	N	W	date	M	L	N	W	
S						1										1							1			S
M						2										2							2			M
T						3										3							3			T
W	1					4										4							4			W
T	2					5										5							5			T
F	3					6										6							6			F
S	4					7										7							7			S
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S	12					15										15							15			S
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TOTAL SHIFTS	4056	Hours	46.6%	<i>of the year</i>
Users shifts	3024	Hours	74.6%	<i>of total</i>
Users	378 shifts	3024	Hours	100.0% <i>of users</i>
Accelerator Physics shifts	129 shifts	1032	Hours	25.4% <i>of total</i>
Shutdown & holidays	581 shifts	4648	Hours	53.4% <i>of the year</i>
TOTAL shifts and shutdown	8704	Hours		



SESAME

Calendar of operations 2019

2019 SESAME beam-time Schedule																										
	January		February		March		April		May		June		July		August		September		October		November		December			
	date	M	L	N	W	date	M	L	N	W	date	M	L	N	W	date	M	L	N	W	date	M	L	N	W	
S						1										1							1			
M						2										2							2			
T						3										3							3			
W	1					4										4							4			
T	2				1	5										5							5			
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S	4				3	7										7							7			
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Accelerator Physics shifts 129 shifts 1032 Hours 25.4% of total

Shutdown & holidays 581 shifts 4648 Hours 53.4% of the year

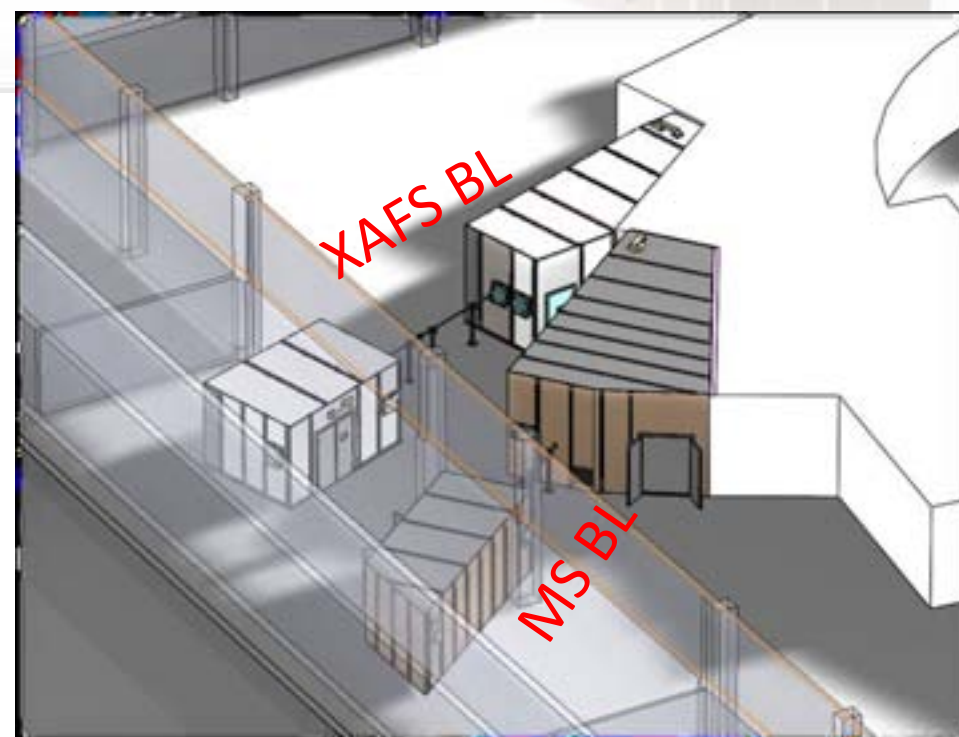
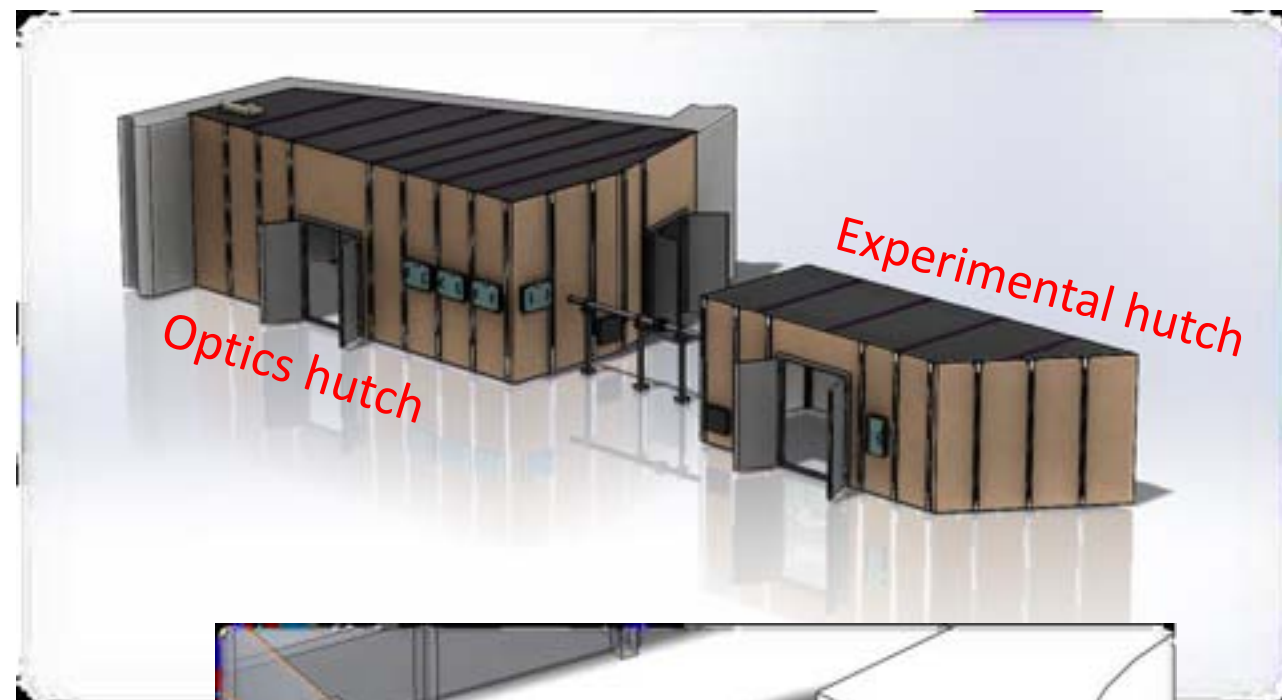
TOTAL shifts and shutdown 8704 Hours

Materials Science

➤ **Materials Science beamline aims:**

Using X ray diffraction techniques for investigating materials' atomic structure

➤ **Beamline Layout**



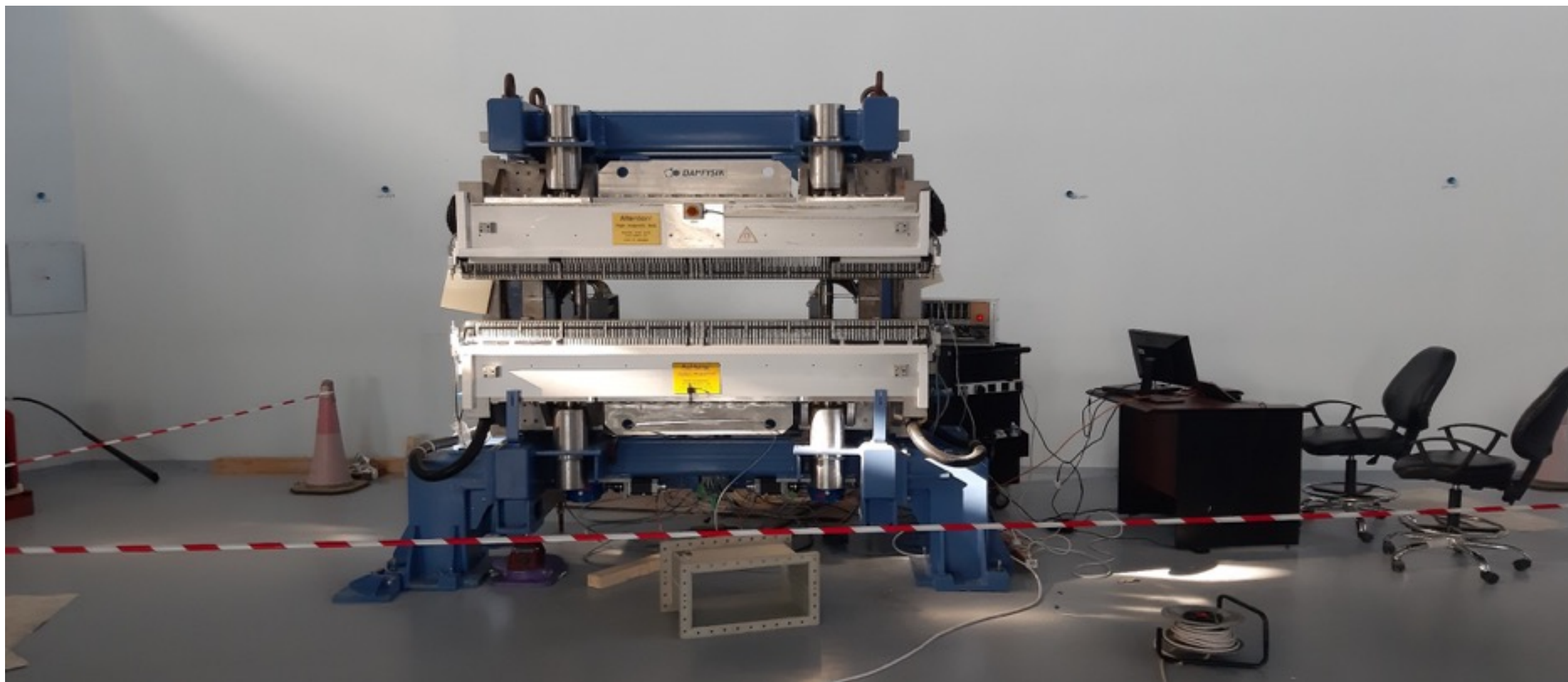
MS safety hutches after installation (February 2018)



**SESAME - XAFS
beamline**

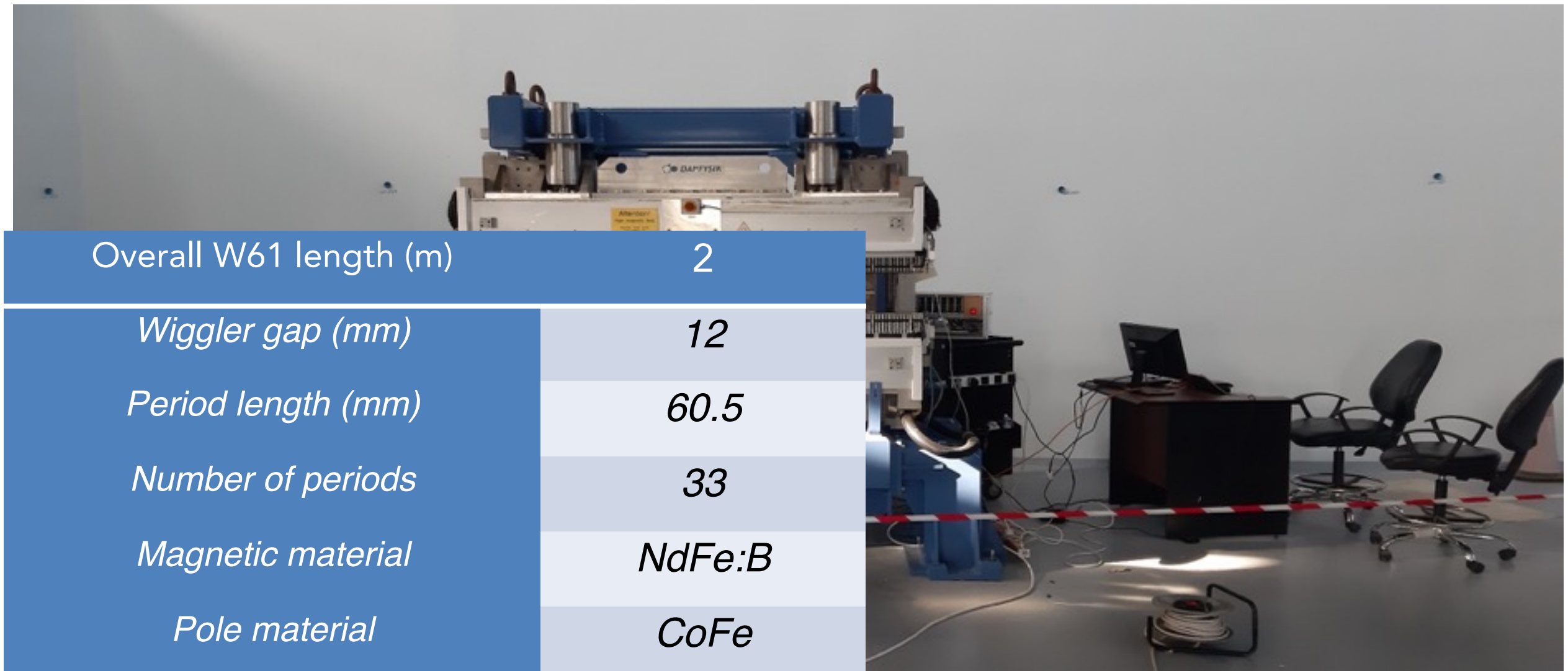
**SESAME - MS hutches after
construction (Feb. 2018)**

Materials Science Source Wiggler source installation (Jan. – Feb. 2019)



Motors have been replaced. Gap was calibrated.
Installation & Alignment strategy identified

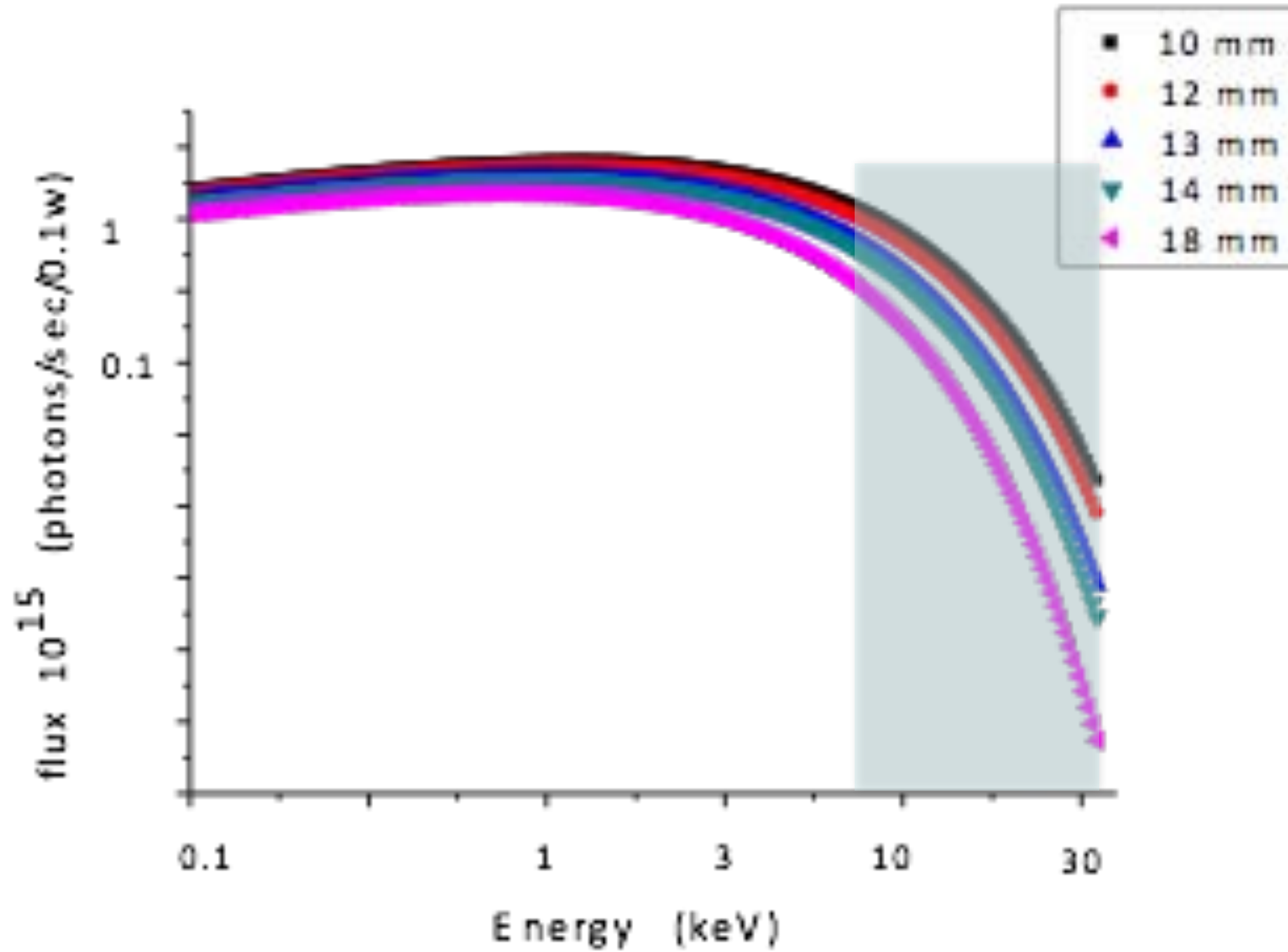
Materials Science Source Wiggler source installation (Jan. – Feb. 2019)



Overall W61 length (m)	2
<i>Wiggler gap (mm)</i>	12
<i>Period length (mm)</i>	60.5
<i>Number of periods</i>	33
<i>Magnetic material</i>	NdFe:B
<i>Pole material</i>	CoFe
<i>Maximum field (T)</i>	1.4
<i>Deviation parameter K</i>	7.8
<i>Critical energy (keV)</i>	5.8
<i>Total power @ 400mA (KW)</i>	6.01

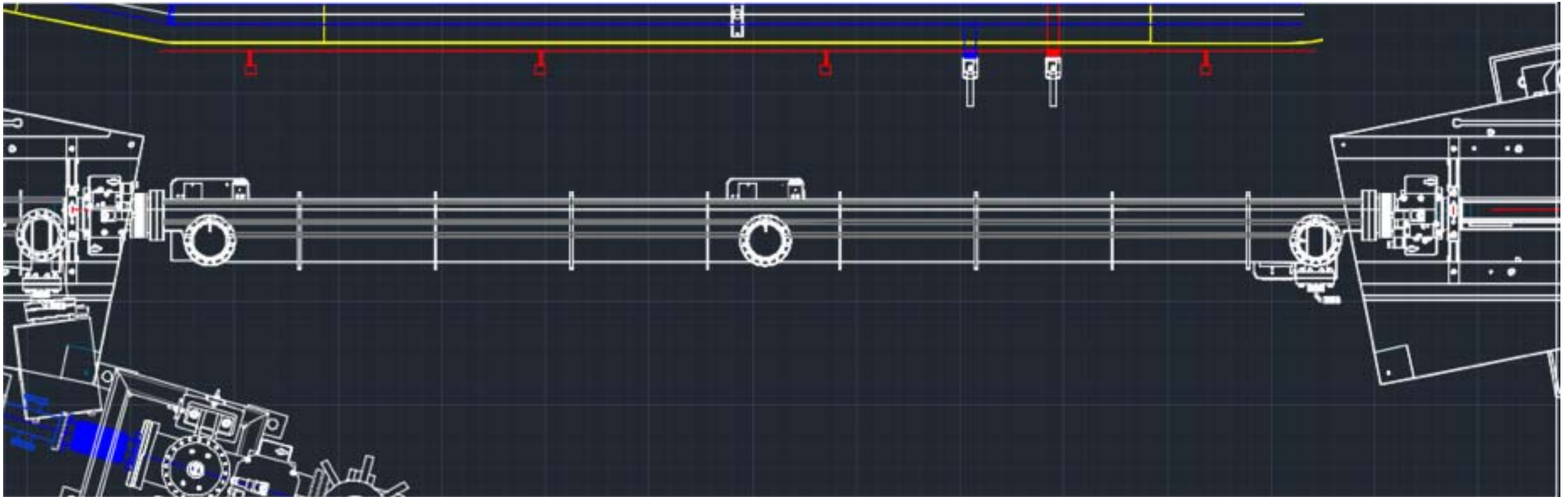
. Gap was calibrated.
strategy identified

Wiggler flux



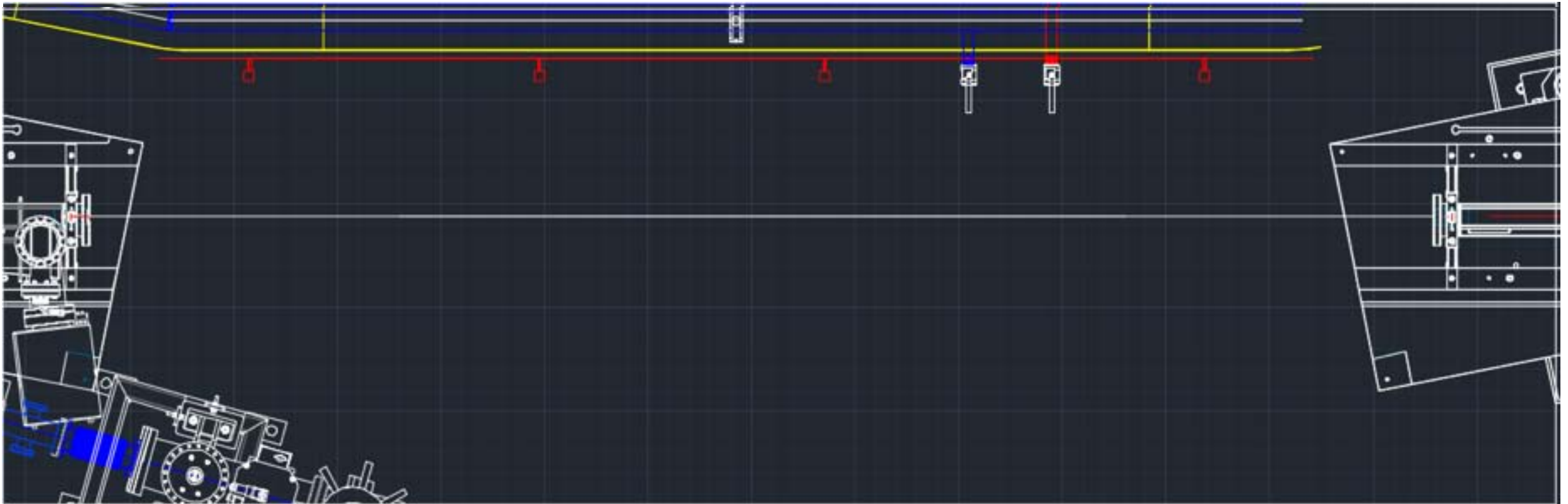
Wiggler installation

Courtesy of Mohammad AL-Najdawi



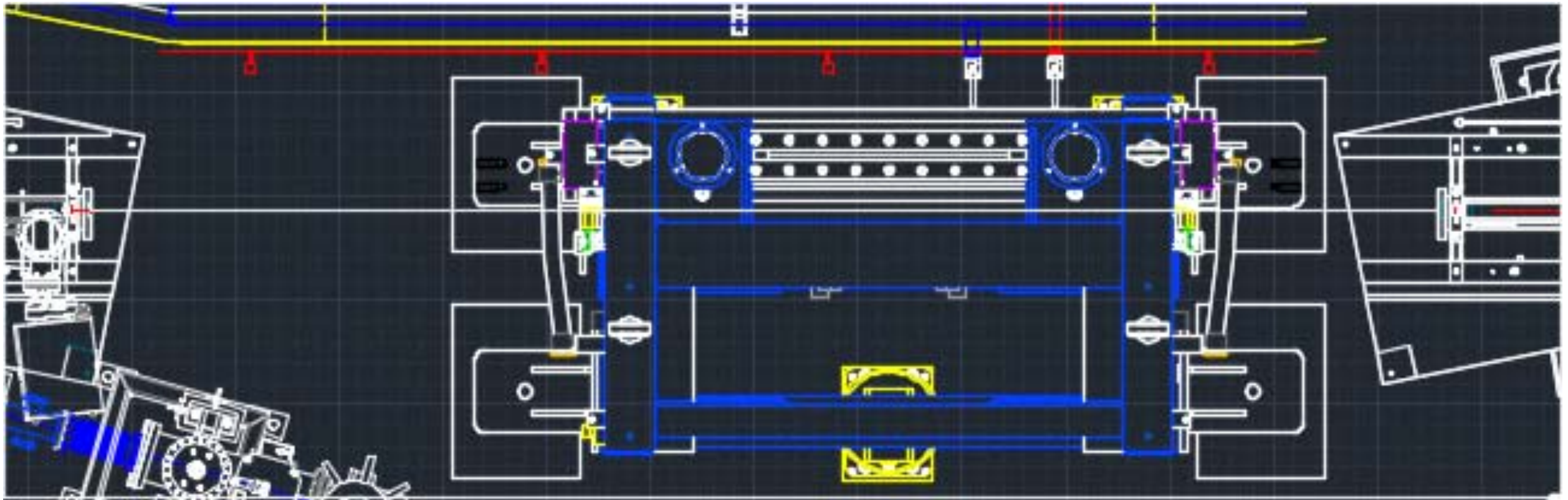
Wiggler installation

Courtesy of Mohammad AL-Najdawi



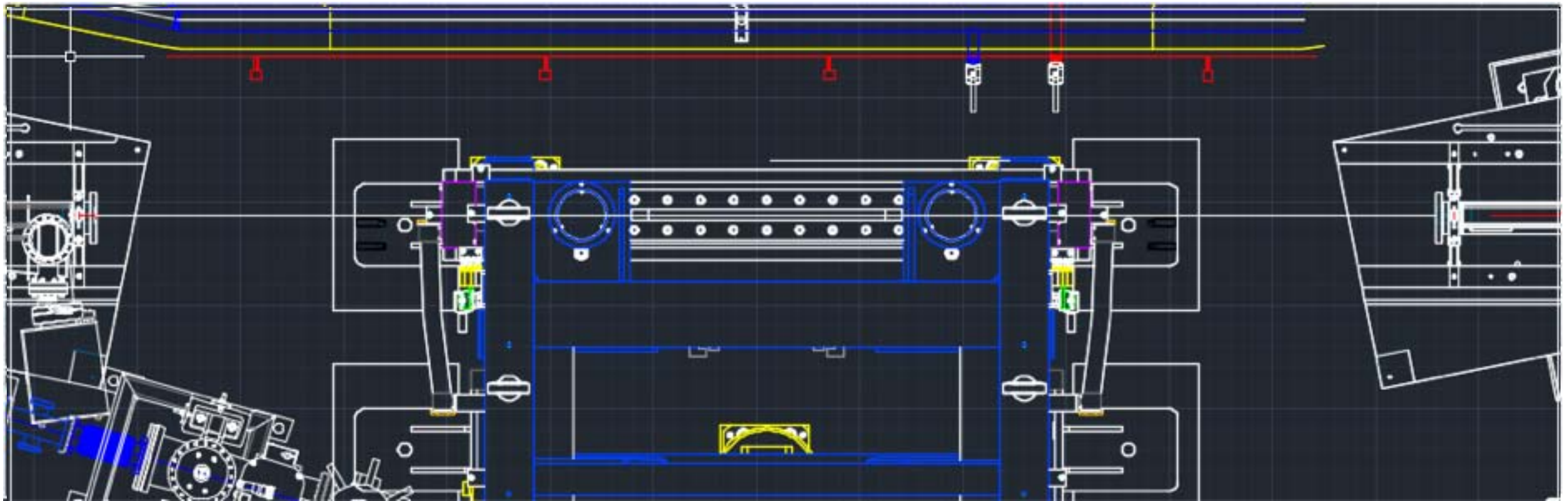
Wiggler installation

Courtesy of Mohammad AL-Najdawi



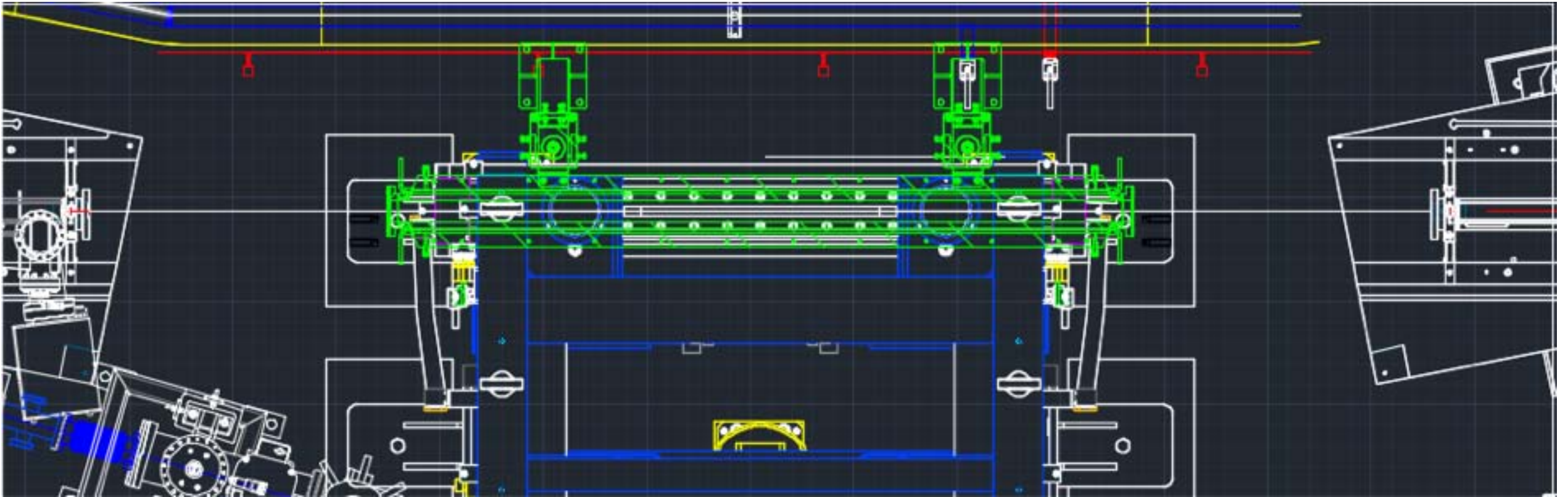
Wiggler installation

Courtesy of Mohammad AL-Najdawi



Wiggler installation

Courtesy of Mohammad AL-Najdawi



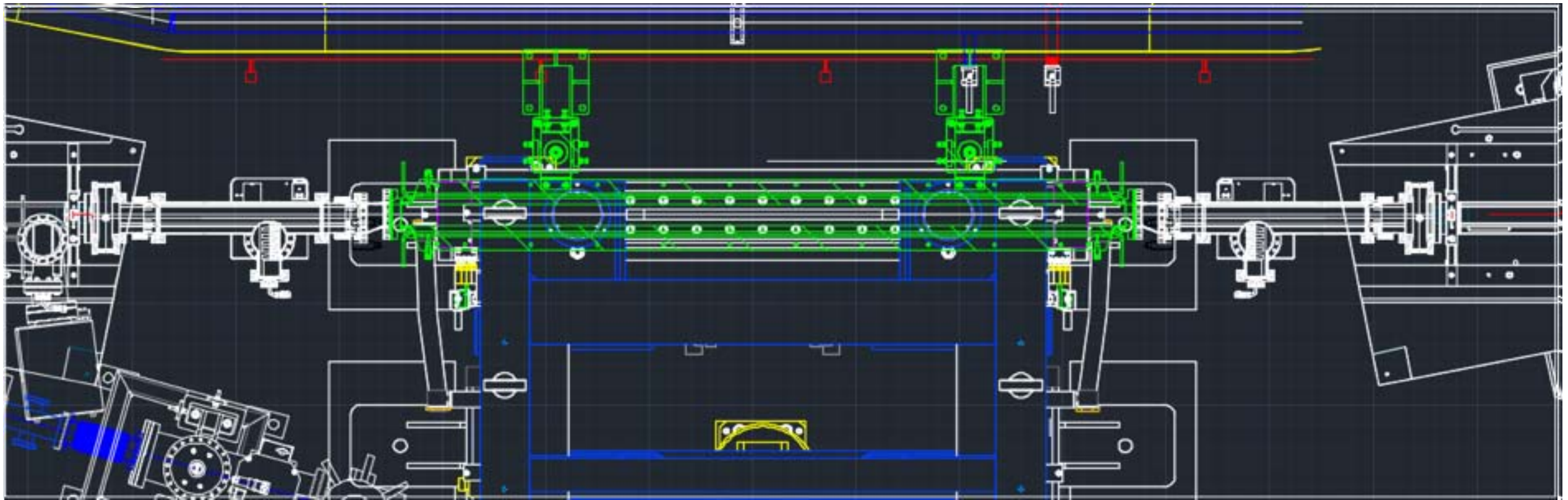
Wiggler installation

Courtesy of Mohammad AL-Najdawi



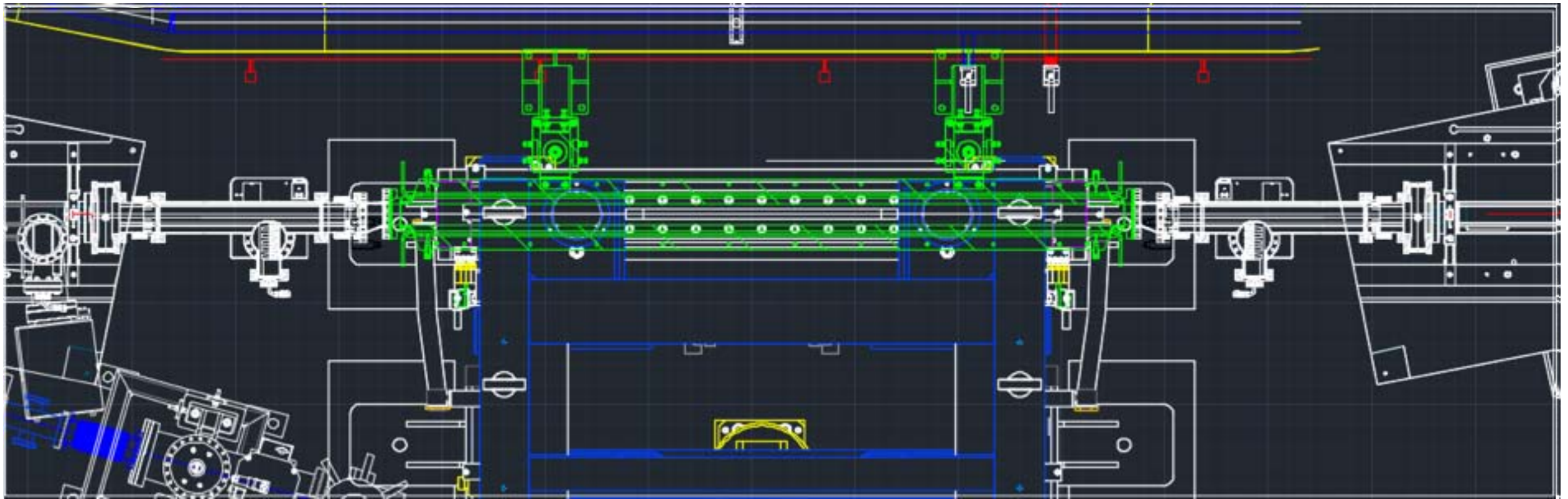
Wiggler installation

Courtesy of Mohammad AL-Najdawi



Wiggler installation

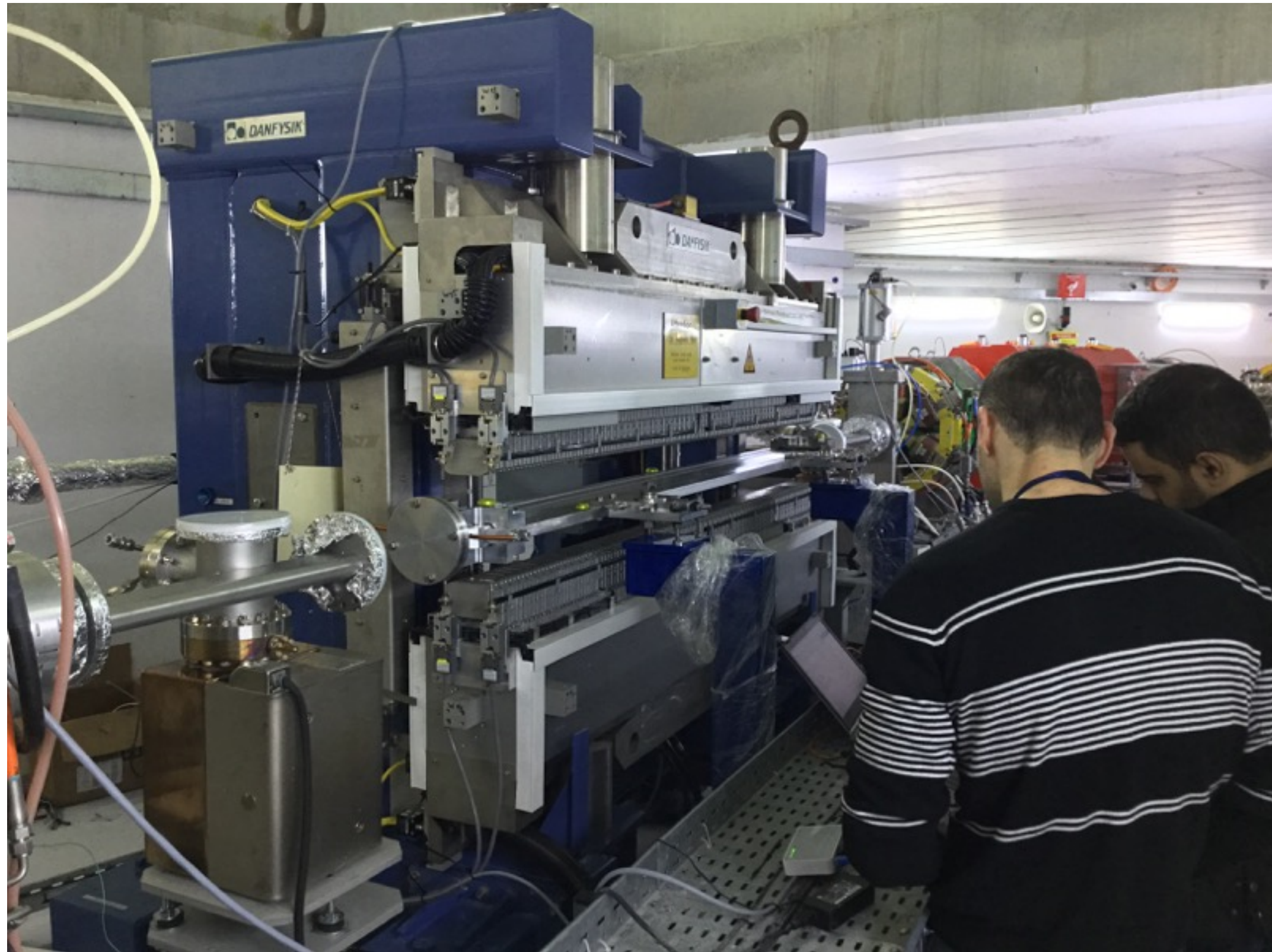
Courtesy of Mohammad AL-Najdawi



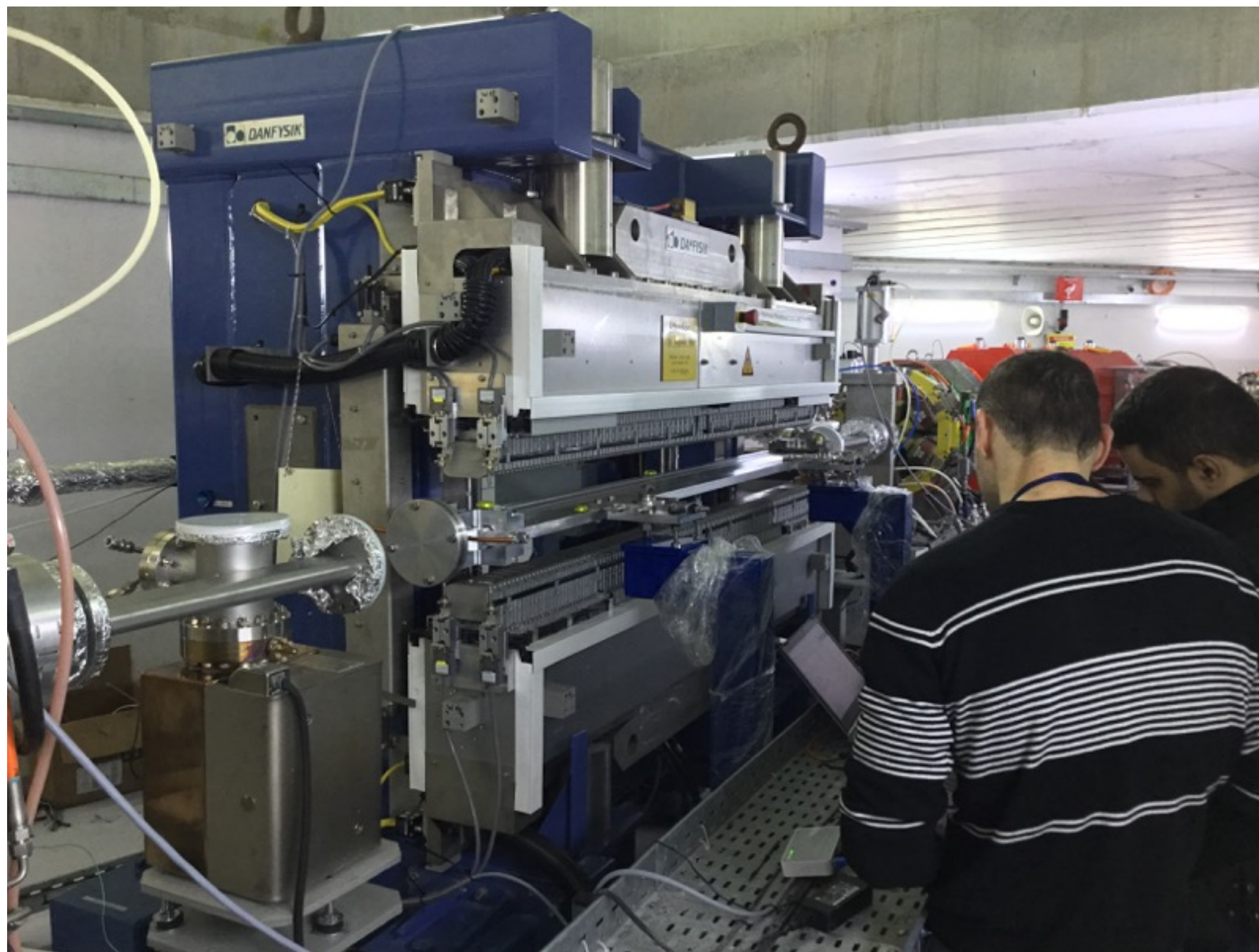
NEG coated Al vacuum chamber delivered.
Up&down stream cambers delivered.

Some front-end components still missing (lack of funding): effect of wiggler on e^- beam to be tested with a provisional absorber.

Wiggler installation



Wiggler installation



Wiggler installation completed: first tests of its effects on e-beam in March 2019

Wiggler installation

Wiggler installation

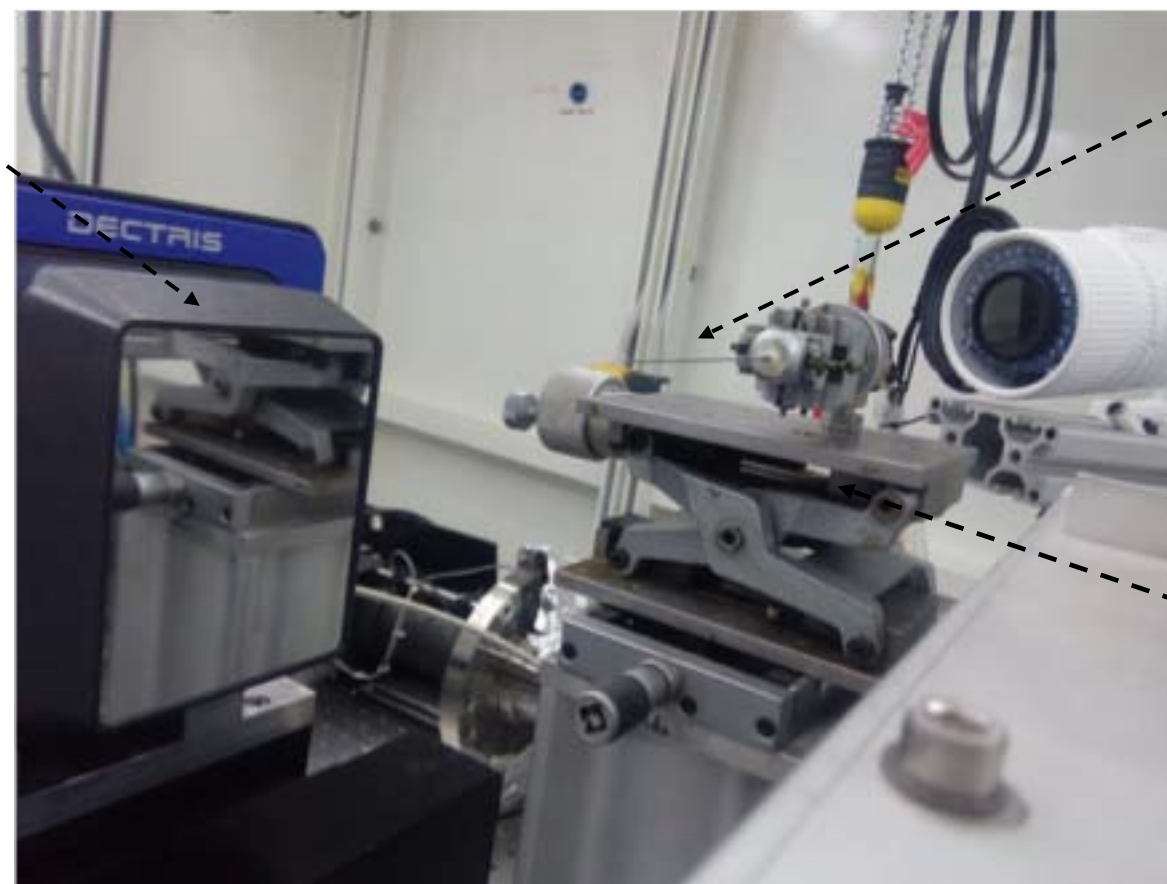
Wiggler installation completed: tests started on
March 17 2019.

Data show **no** detrimental effect on the electron
beam

First X ray diffraction experiment using the Pilatus detector for MS beamline (test at the XAFS beamline)

Pilatus area detector
(Donation by DECTRIS
company)

Area	83.8 × 106.5 mm ²		
Pixel size	172 × 172 μm ²		
Format	487 × 619 = 301,453 pixels		
Dynamic range	20 bits (1:1,048,576)		
Readout time	7 ms		
Framing rate	500 Hz		
Point-spread function	< 1 pixel		
Silicon sensor thickness	320 μm	450 μm	
Quantum efficiency*	91 %	91 %	5.4 keV (Cr)
	96 %	97 %	8.0 keV (Cu)
	37 %	47 %	17.5 keV (Mo)
	20 %	27 %	22.2 keV (Ag)
Cooling	Closed circuit water-cooling unit for temperature stabilization (23°C)		
Power consumption	30 W		
Dimensions (WHD)	160 × 194 × 262 mm ³		
Weight (Detector Head)	7.5 kg		

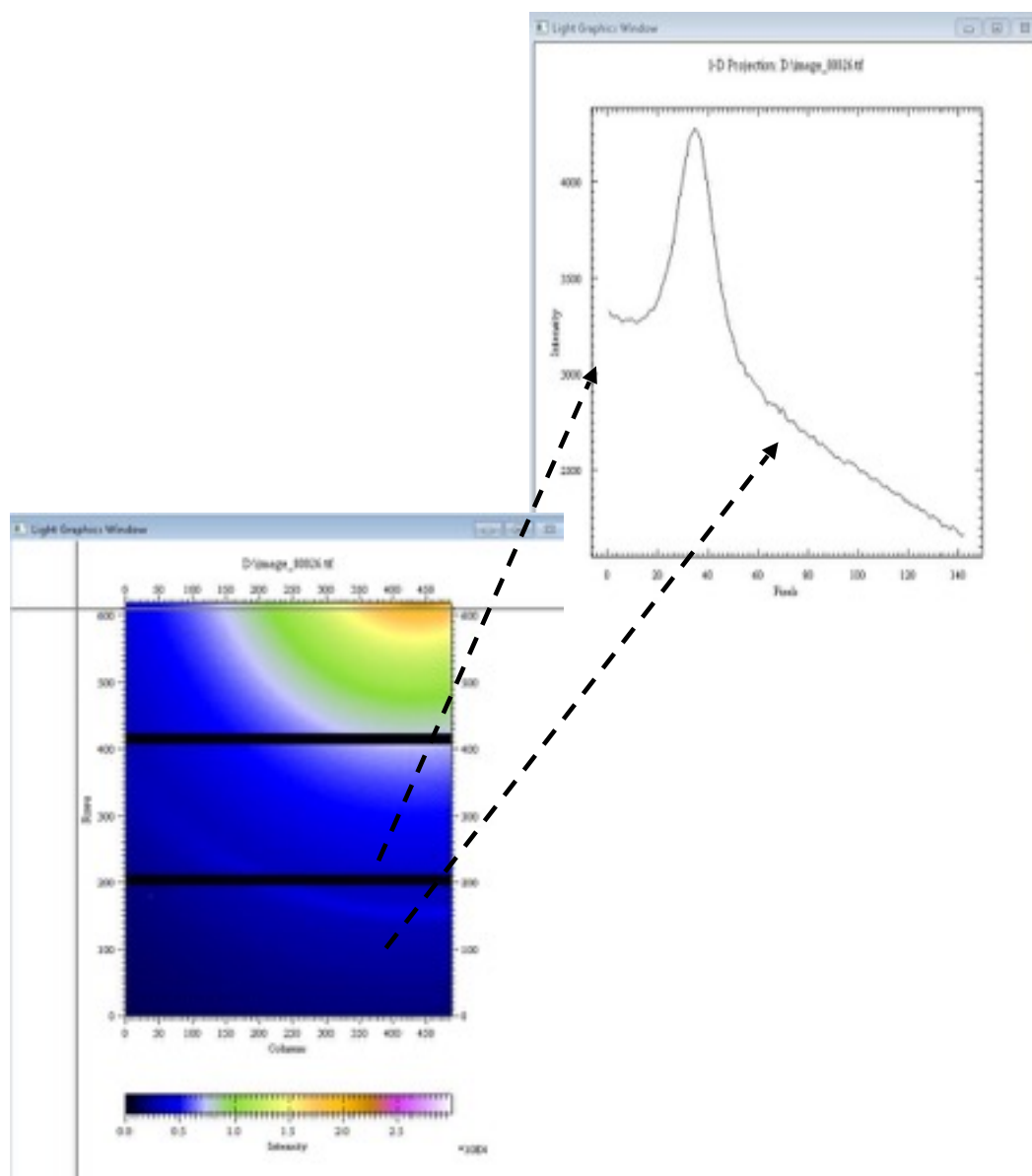


Silicon
sample
capillary

Z-Y manual
stage

First X ray diffraction experiment using the Pilatus detector for MS beamline (test at the XAFS beamline)

X Ray Diffraction of Silicon standard @ 10 keV



Diffractometer: donated by Diamond LS



**MS BL completion:
expected by the end of 2019**



OPEN SESAME

Approved 3 year project, starting on January 1 2017

Participant No.	Participant organisation name	Country
1*	Installation Européenne de Rayonnement Synchrotron (ESRF)	FR
2	Consorcio para la Construcción, Equipamiento y Explotación del Laboratorio de Luz Sincrotrón (CELLS)	ES
3	The Cyprus Institute (CYI)	CY
4	Deutsches Elektronen-Synchrotron (DESY)	DE
5	Sincrotrone Trieste (ELETTRA)	IT
6	Istituto Nazionale Fisica Nucleare (INFN)	IT
7	Instruct Academic Services Limited (Instruct)	UK
8#	Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME)	JO
9	Société Civile Synchrotron Soleil (SOLEIL)	FR
10	European Organization for Nuclear Research (CERN)	CH
11	Centre National de la Recherche Scientifique (CNRS)	FR



OPEN SESAME

WP1: Management and dissemination
coordination

WP2: SESAME staff training and exchange programme
staff exchanges between SESAME and European labs

WP3: Building user capacity in the local science and technology landscape
bursaries for training of perspective users
thematic schools

WP4: Integration of SESAME into public and social-economic landscapes
communication, industry involvement

WP3 “Building user capacity in the local science and technology landscape” SUMMARY

Task 3.1 consists of a set of four thematic schools on Cultural Heritage, Biological and Biomedical Applications, **Structural Biology and Environmental Sciences targeting researchers from the Middle East on highly relevant research topics linked to the day one SESAME beamlines. Each one week school will host at least 20 funded participants**

Task 3.2 targets young researches through organising

I. A tailored HERCULES School, building on the highly regarded HERCULES courses (www.hercules-school.eu) which have been run in Europe for 25 years as an introduction to large-scale facilities including light sources.

II. Short term fellowship programme (two calls) which will permit at least 18 Masters and PhD students registered in SESAME Member higher education institutes to visit a European light sources (participant institutions) for 1-3 months on a specific research project.

2 Months is likely the optimum duration (trade-of between funding and profitability).

Task 3.3 targets the industrial usage of SESAME. It will build a contact list and network out to industry and applied-science researchers in the SESAME Members, including the organisation of a workshop on synchrotron light applications for industry.

Task 3.4 will create an on-line “training warehouse” where all the training materials generated by WP3 and other OPEN SESAME activities will be harvested and distributed

Task 3.1.4. Environmental sciences. **ELETTRA**.

Key dates:

- I) Deadline for receiving applications: 15-02-2019; (at least 6 weeks).
- II) 4 weeks for selecting the 20 funded students (fair distribution of gender and nationalities) but based on the CVs and motivation letters (related to the scope of the course). Funded students restricted to working/enrolled in an institution of the 9 SESAME members. 15-03-2019
- III) Two weeks for issuing invitation letters (from Host, in this case SESAME) → 18-03-2017
- IV) Two months (minimum) to get the visa (if applicable) → Mid May-2019.
- V) To arrange the travel details for the funded students (at least 2/3 weeks)

Date and place of the school: 23-27 June-2019 @ SESAME

→ Information to be spread by: I) SESAME channels (1: Users Committee members; 2: Council delegates via the Council Secretary; 3: Users mailing list (Registered SESAME Users, portal (greta.facile@sesame.org.jo)); II) ELETTRA contacts (andrea.lausi@elettra.eu, andrea.goldoni@elettra.eu, cecilia.blasetti@elettra.eu) ; III) etc.

→ Lecturers (5 funded lecturers, 1 likely from SESAME). Additional 'local' lecturers are expected/encouraged but they can not be funded.

→ Students (20 fully funded students). Additional 'local' attendees are expected but they can not be funded (perhaps lunches...). **xx applicants. xx selected (& funded)**

Course information: <http://www.elettra.eu/Conferences/2019/ESTSchool/Main/HomePage>

Task 3.2.1. Tailored HERCULES school for the Middle East. **ESRF-SESAME.**

Program: Final version: Mid February-2019. Information launched (program completed).

Key dates:

- I) Deadline for receiving applications: 04-06-2019; (at least 6 weeks).**
- II) 4 weeks for selecting the 20 funded students (fair distribution of gender and nationalities) but based on the CVs and motivation letters (related to the scope of the course). 10-07-2019**
- III) Two weeks for issuing invitation letters (from Host, in this case SESAME) → 26-07-2017**
- IV) Two months (minimum) to get the visa (if applicable) → Early October-2019.**
- V) To arrange the travel details for the funded students (at least 3/4 weeks)**

Date and place of the school: **Saturday-26th of October to Friday-8th of November - 2019**

@ Amman – SESAME (*likely close to SESAME users meeting*)

→ Information to be spread by: I) SESAME channels (1: Users Committee members; 2: Council delegates via the Council Secretary; 3: Users mailing list (Registered SESAME Users, portal (greta.facile@sesame.org.jo); II) ESRF/HERCULES contacts (vincent.favre-nicolin@esrf.fr, krisch@esrf.fr, vincent.favre-nicolin@esrf.fr) ; III) etc.

→ Lecturers (5-8 funded lecturers from abroad plus several from SESAME).

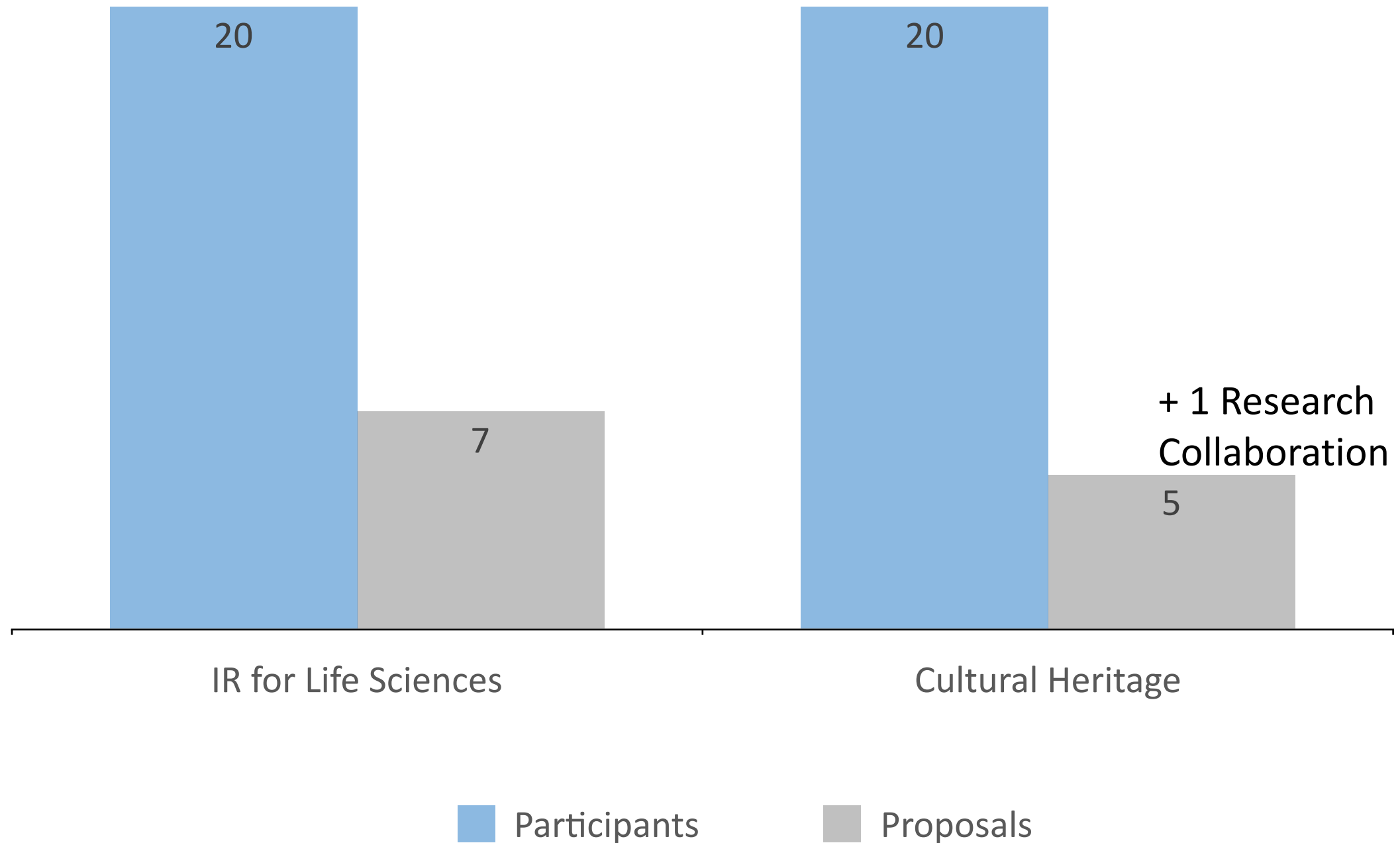
→ Students (20 fully funded students). Additional 'local' attendees are expected but they can not be funded (perhaps lunches...). **xx applicants. xx selected (& funded)**

Course information: <http://XXXXXXXXXXXXXXXXXXXXXXXXXXXX>



OPEN SESAME

Thematic Schools: Impact on the IR-BL



12 of 43 submitted IR proposals are from newcomers who participated to the OPEN SESAME schools(Call 2018)



Open call

H2020-INFRA-SUPP-2018-2020

(Deadline 20 March 2018)

Support the development and installation of a dedicated beam-line in SESAME. The proposal should help strengthening the links to the European network of analytical facilities with particular reference to new synchrotrons currently under development. **The consortium will work with the SESAME Scientific Advisory Committee to define the scope of the beam-line more appropriate for the scientific community of reference.** It should involve European partner laboratories having similar energy and technical specifications in the design and development of the beam-line components and the related instrumentation. The action will cover the installation of the beam-line and its initial commissioning. **The action should also address how SESAME will secure the necessary human and financial resources for the operation of the beam-line.**

Expected budget 6 M€

BEATS

5	BEATS (BEAmline for Tomography at SESAME)	~4.5 - ~30 keV	Super Bend or Three pole wavelength shifter	<ul style="list-style-type: none">• EU funded (~6 M€ total, ~3.6M€ for SESAME)
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SESAME

Horizon 2020

Call: H2020-INFRASUPP-2018-2020

(Support to policy and international cooperation)

Topic: INFRASUPP-01-2018-2019

Type of action: RIA

Proposal number: SEP-210496061

Proposal acronym: BEATS

Deadline Id: H2020-INFRASUPP-2018-1



SESAME

BEATS: Abstract

The overall objective of the project [Beamline for Tomography at SESAME \(BEATS\)](#) is to pave the way for an efficient and sustainable operation of the Synchrotron light for Experimental Science and Applications in the Middle East (SESAME) research infrastructure. The project builds upon the OPEN SESAME project, and has the following key objectives:

- Develop and consolidate the scientific case and build up a science community, paying particular attention to the R&D and technology needs of the SESAME Members and beyond. Today, there is already significant interest from the Cultural Heritage and Archaeology community. Applications in Environmental and Materials Sciences, with links to industries in the region, shall also be explored;
- Design, procure, construct, and commission a beam line for hard X-ray full-field tomography at SESAME;
- Foster collaborations among the project partners in all aspects of the technical work to ensure that a comprehensive transfer of knowledge to SESAME staff is accomplished within the lifetime of the project;
- Address the issue of sustainability of operation by preparing medium- to long-term funding scenarios for the tomography beamline and the facility.

In this context, the participation of CELLS and SOLARIS, which both operate storage rings of energy similar to that of SESAME, is of particular value as both research infrastructures plan the construction of a hard X-ray imaging beam line mainly focused on computed micro-tomography. They will therefore directly profit from the common technical developments. The consortium is a blend of leading research facilities in the Middle East (SESAME and the Cyprus Institute), well established European synchrotron radiation facilities and high-energy laboratories (DESY, ELETTRA, ESRF, INFN and PSI) with a decades-long experience in synchrotron radiation research and technology, and more recently founded synchrotron laboratories (ALBA and SOLARIS)

BEATS: partnership

Participant No.	Participant organisation name	Country
1	EUROPEAN SYNCHROTRON RADIATION FACILITY	FR
2	SYNCHROTRON-LIGHT FOR EXPERIMENTAL SCIENCE AND APPLICATIONS IN THE MIDDLE EAST	JO
3	THE CYPRUS INSTITUTE	CY
4	UNIWERSYTET JAGIELLONSKI	PL
5	CONSORCIO PARA LA CONSTRUCCION EQUIPAMIENTO Y EXPLOTACION DEL LABORATORIO DE LUZ SINCROTRON	ES
6	PAUL SCHERRER INSTITUT	CH
7	STIFTUNG DEUTSCHES ELEKTRONEN-SYNCHROTRON DESY	DE
8	ELETTRA - SINCROTRONE TRIESTE SCPA	IT
9	ISTITUTO NAZIONALE DI FISICA NUCLEARE	IT

BEATS main design characteristics

- Based on TOMCAT (SLS)
- Avoid if possible the use of SLS type superbending (expensive and intrusive)
- Simplify the monochromator design (DMM only, no DCM option)
- Make maximum use of the available space (put as many components as possible in the SR tunnel)



SESAME

BEATS preliminary studies for the source

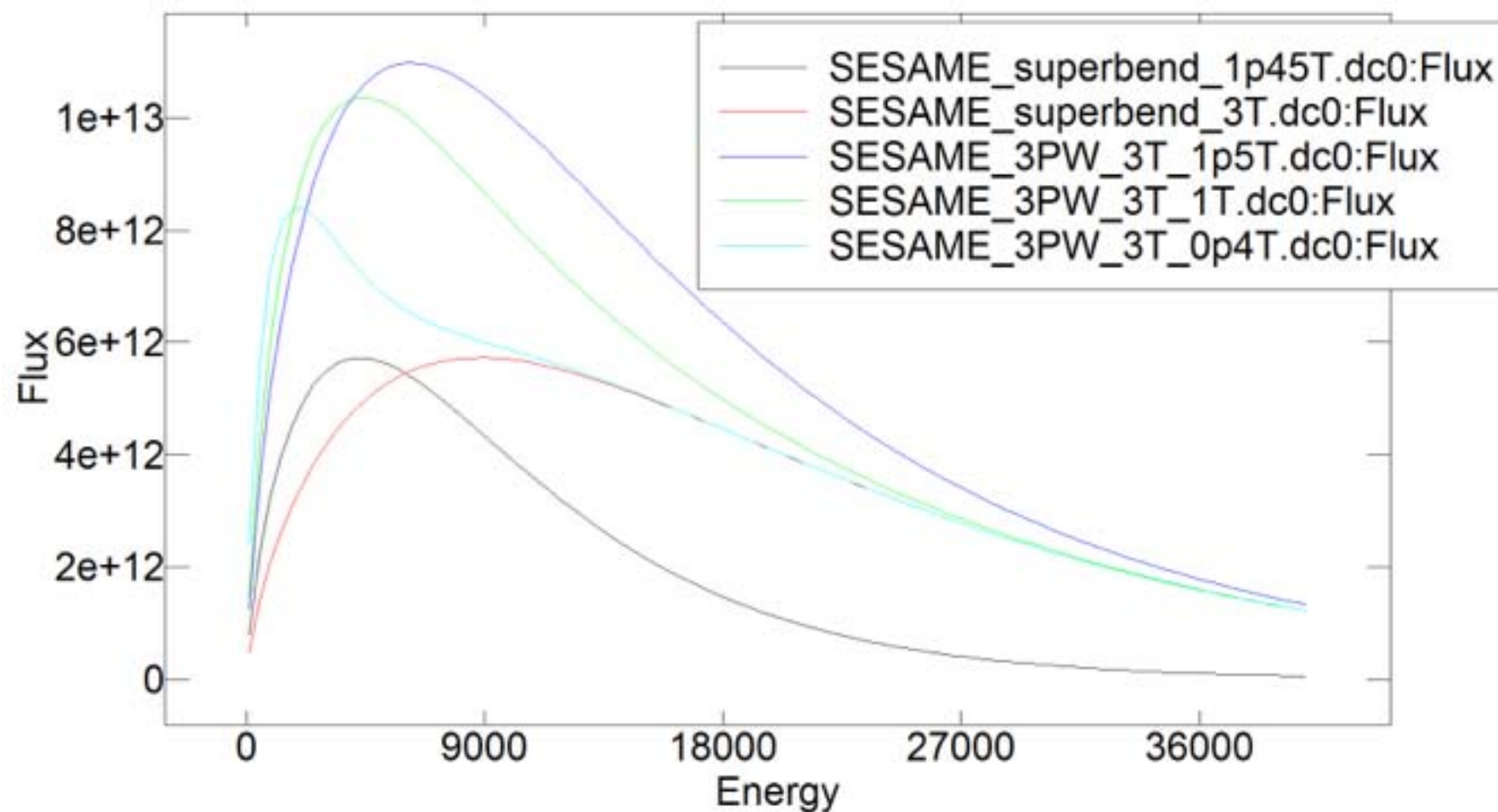
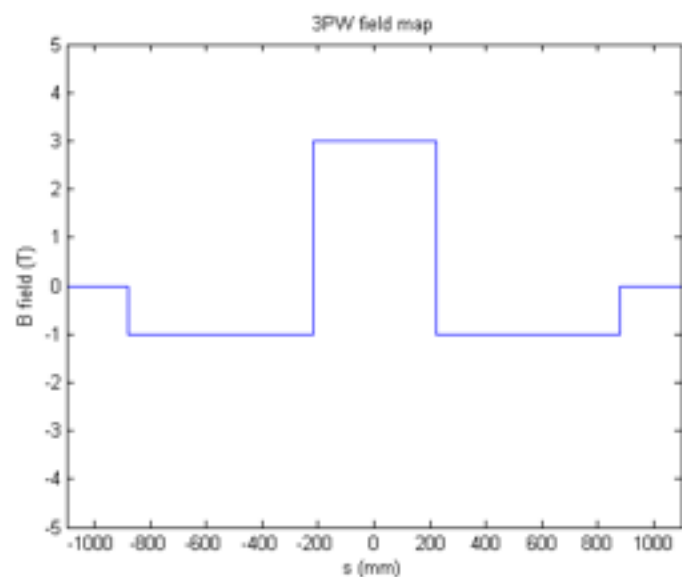
Increase the critical energy (now at 6.04 keV – 1.45 T – 2.5 GeV)

Status:

WP3 source:

led by INFN + ALBA + SESAME

decision on source type by April 19
impact on optics of 3PW acceptable
comparison of superbend – 3PW



Source magnetic and mechanical design
with ALBA (J. Campmany)

BEATS preliminary studies for the source

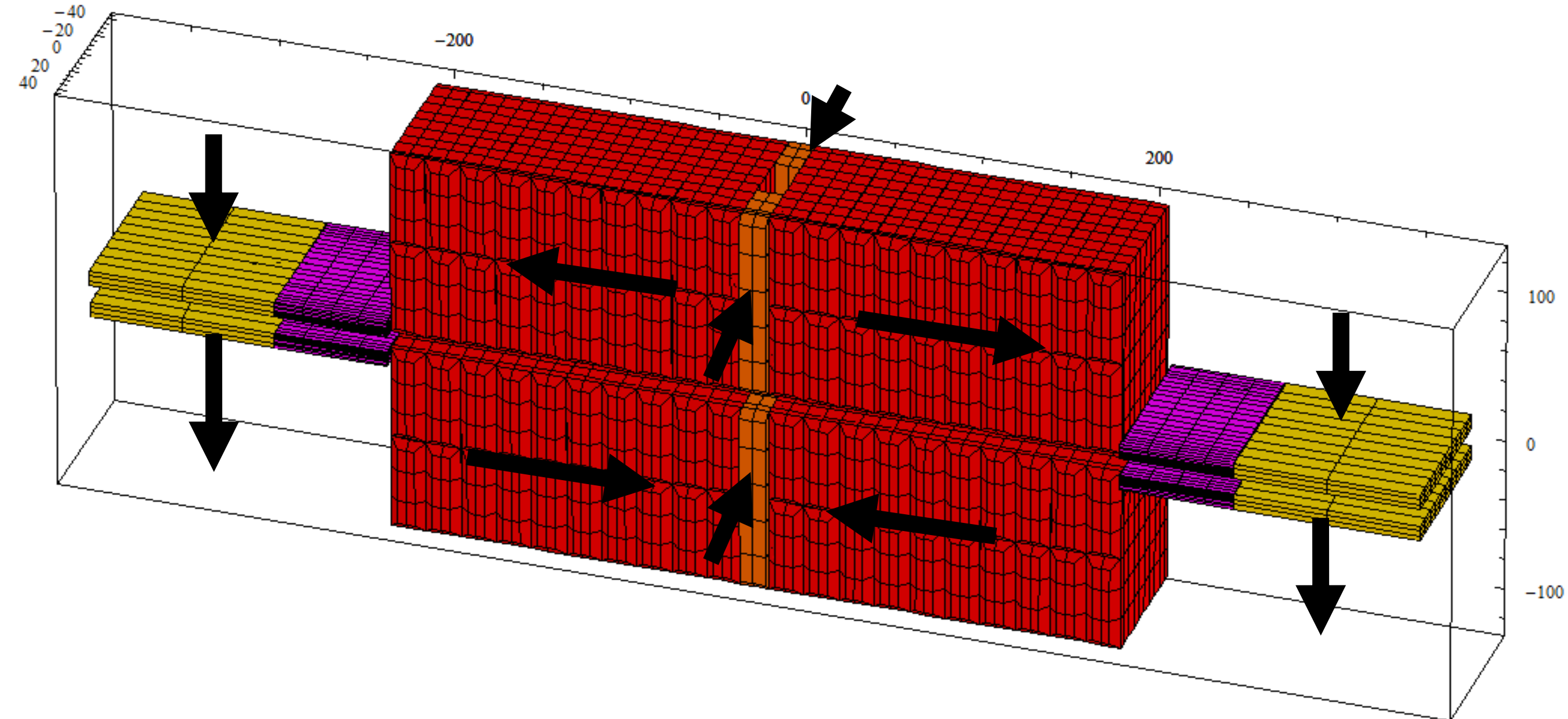
Increase the critical energy (now at 6.04 keV – 1.45 T – 2.5 GeV)

Status:

WP3 source:

led by INFN + ALBA + SESAME

3PW (Courtesy of Josep Campmany)



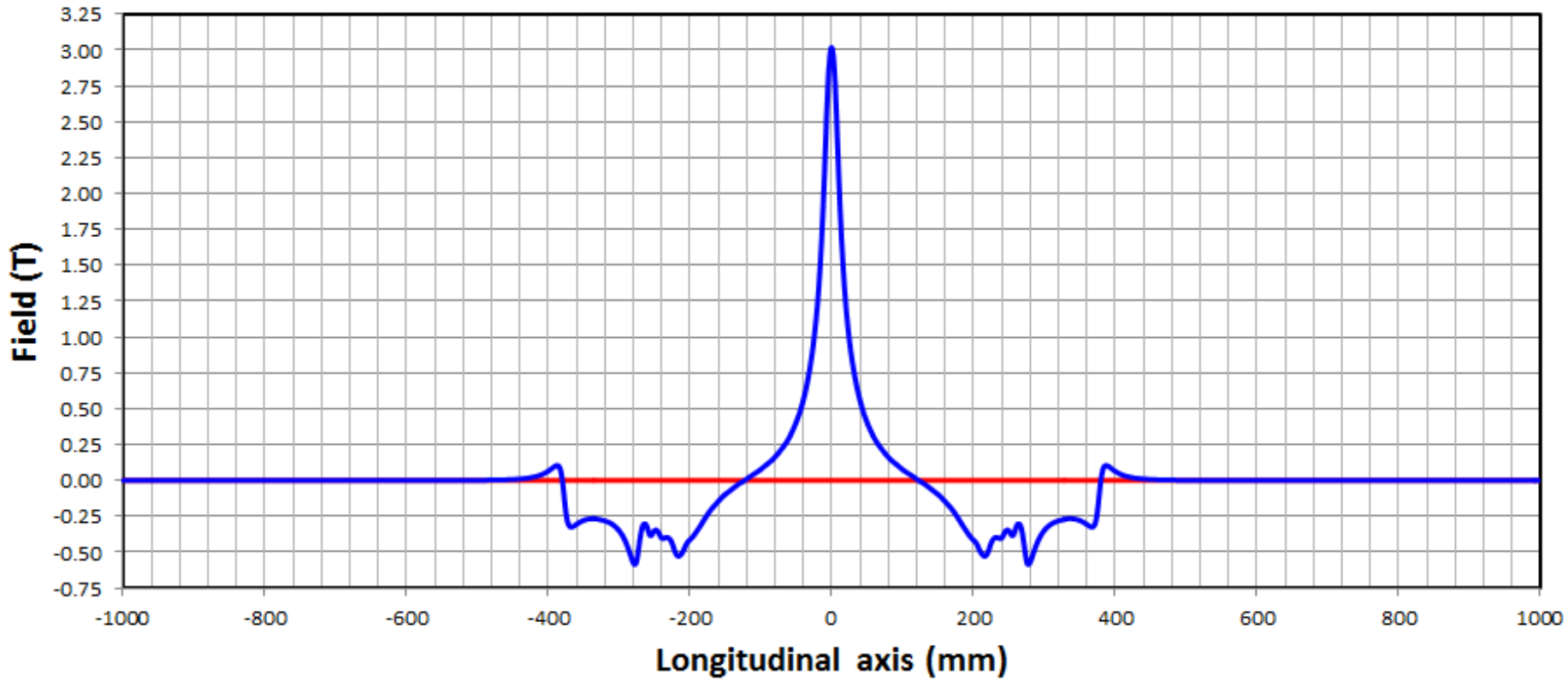
BEATS preliminary studies for the source

Increase the critical energy (now at 6.04 keV – 1.45 T – 2.5 GeV)

Source

led by INFN + ALBA + SESAME

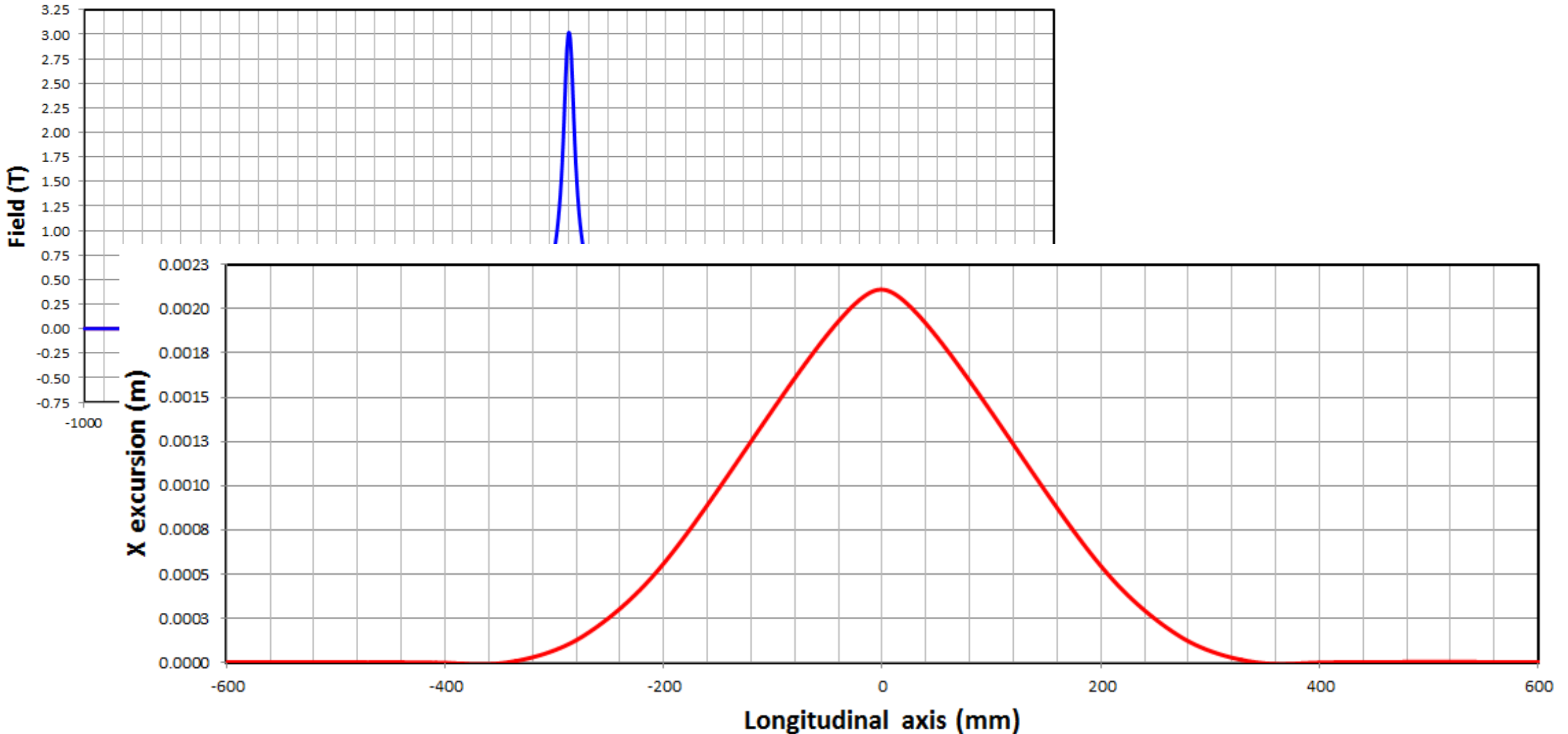
3PW (Courtesy of Josep Campmany)



BEATS preliminary studies for the source

Increase the critical energy (now at 6.04 keV – 1.45 T – 2.5 GeV)

Source
led by INFN + ALBA + SESAME
3PW (Courtesy of Josep Campmany)



BEATS preliminary studies for the source

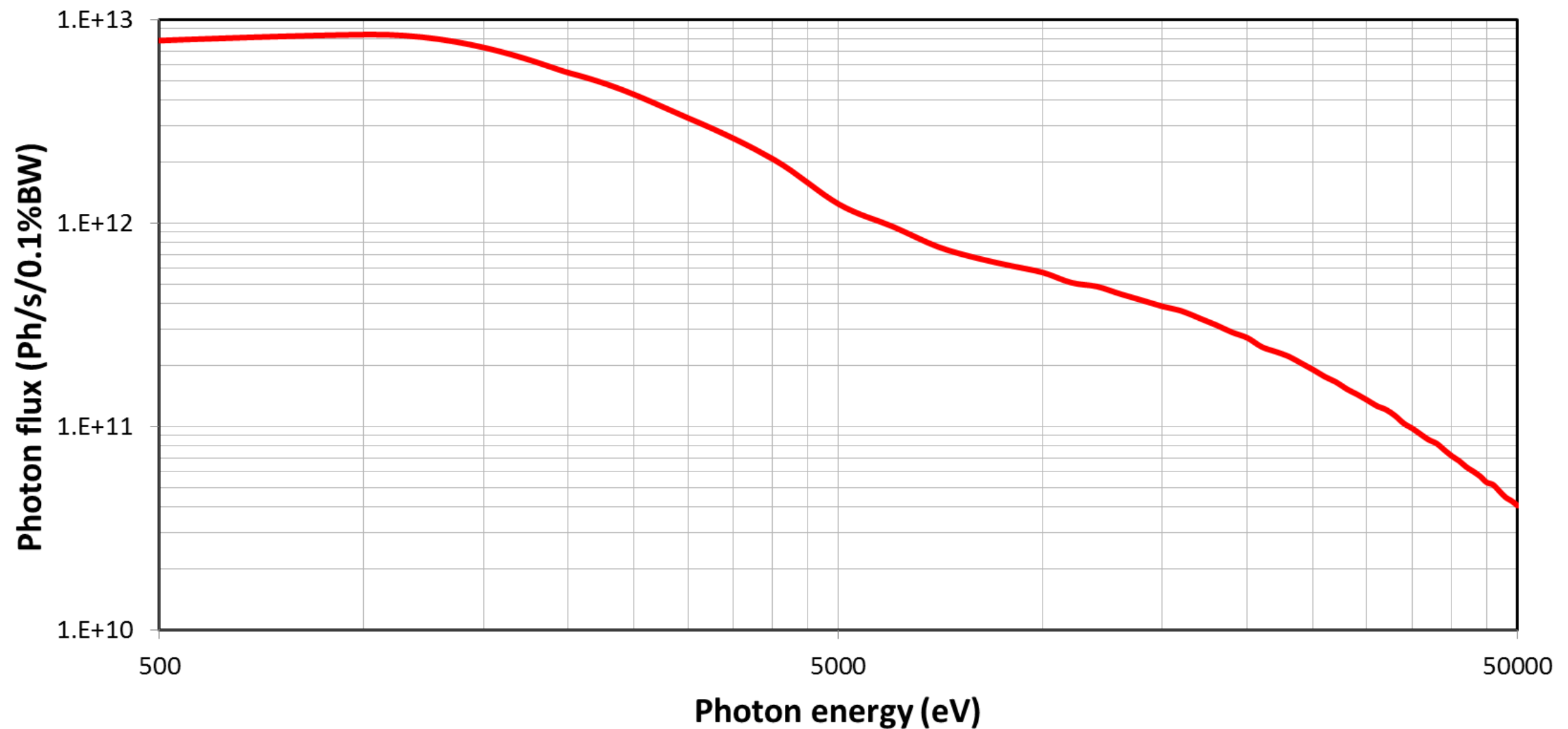
Increase the critical energy (now at 6.04 keV – 1.45 T – 2.5 GeV)

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3PW (Courtesy of Josep Campmany)





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Provides the Region with a unique research infrastructure

Fosters basic and applied science

Contributes to international research in the Region.



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With good and improving accelerator performances, TWO beamlines accepting users, and more beamlines to come
SESAME is not a promise anymore: it is REALITY.