

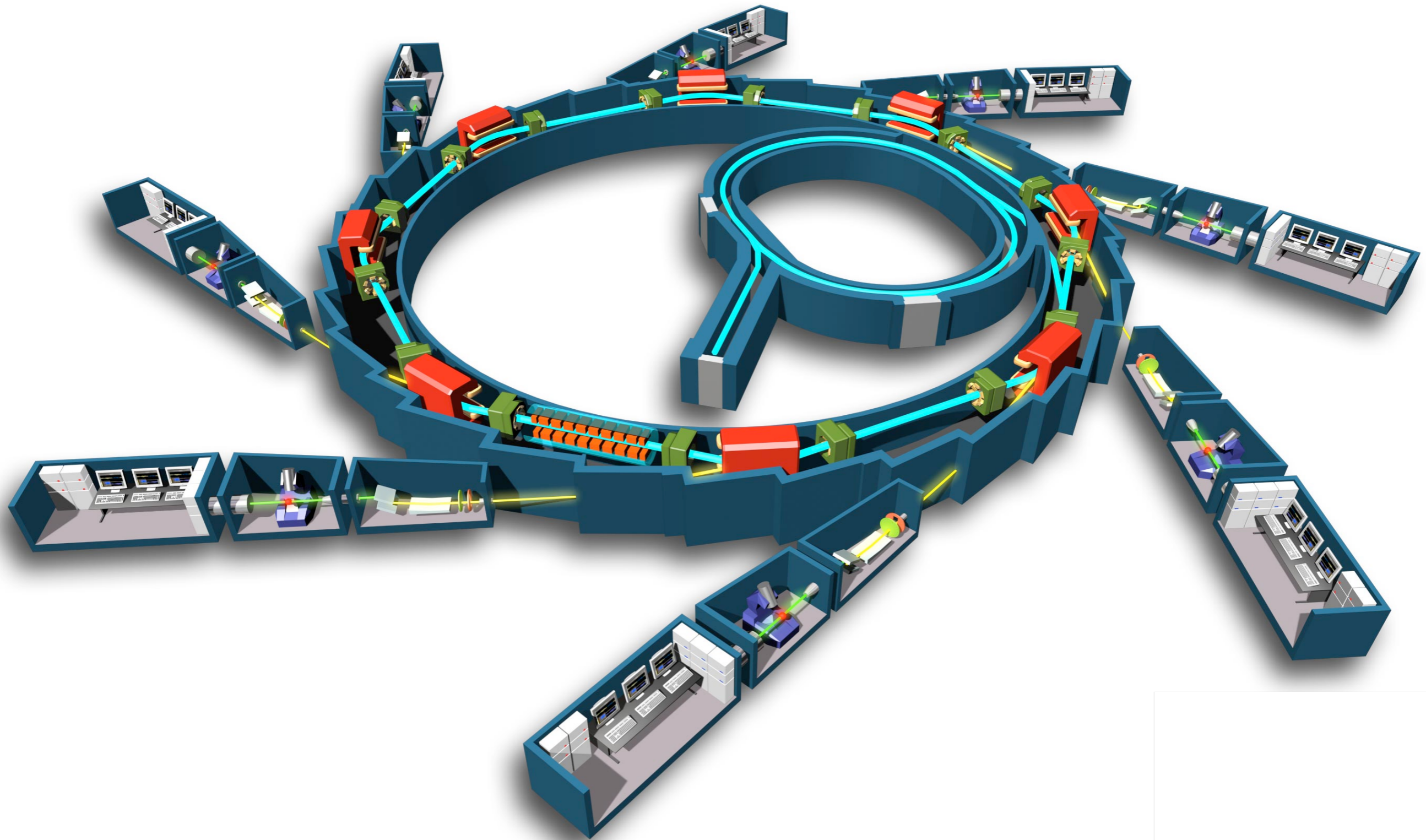


SESAME: luce al servizio della pace e della crescita nel Medio Oriente

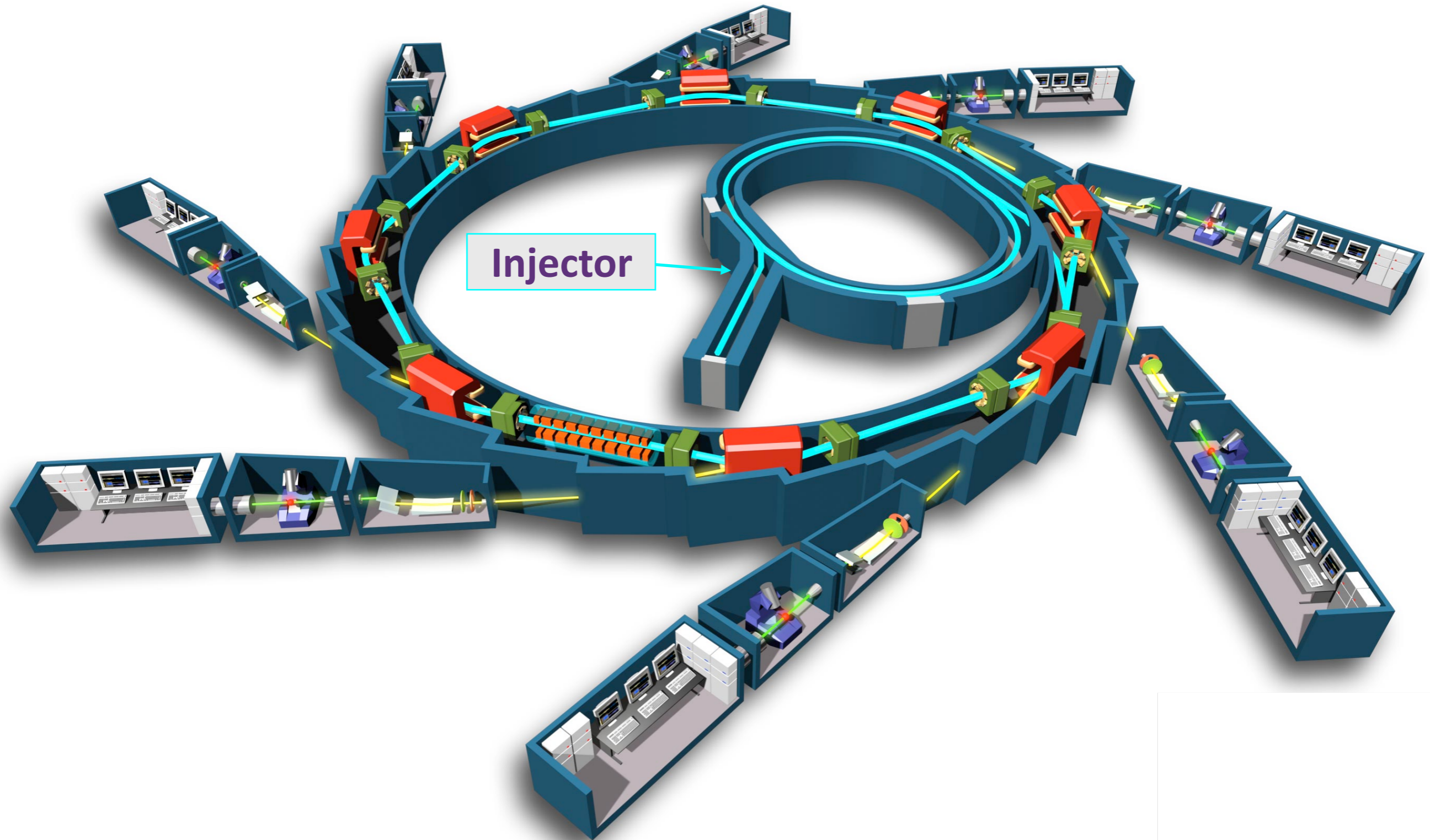
Giorgio Paolucci

Scientific Director - SESAME

A synchrotron light source

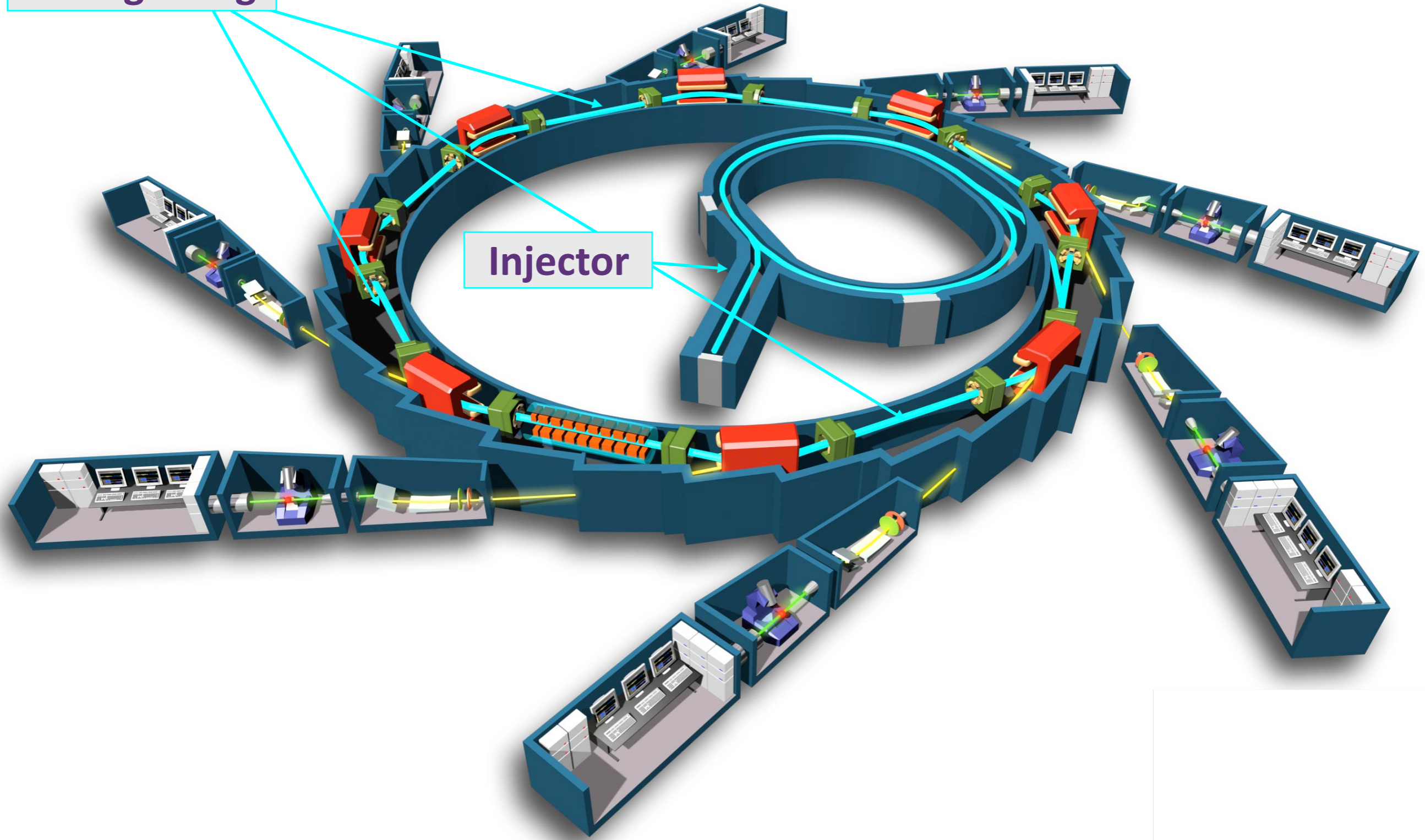


A synchrotron light source



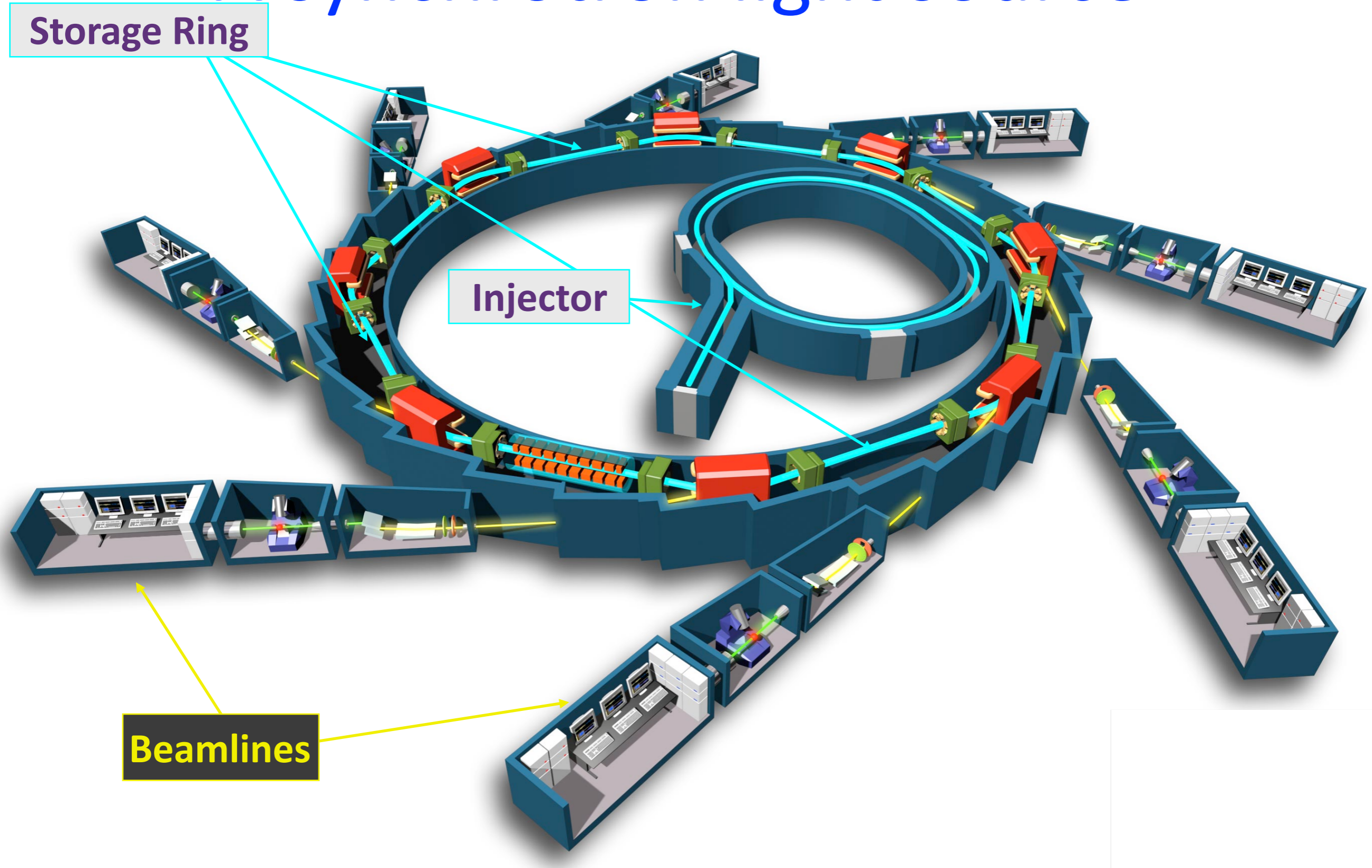
A synchrotron light source

Storage Ring

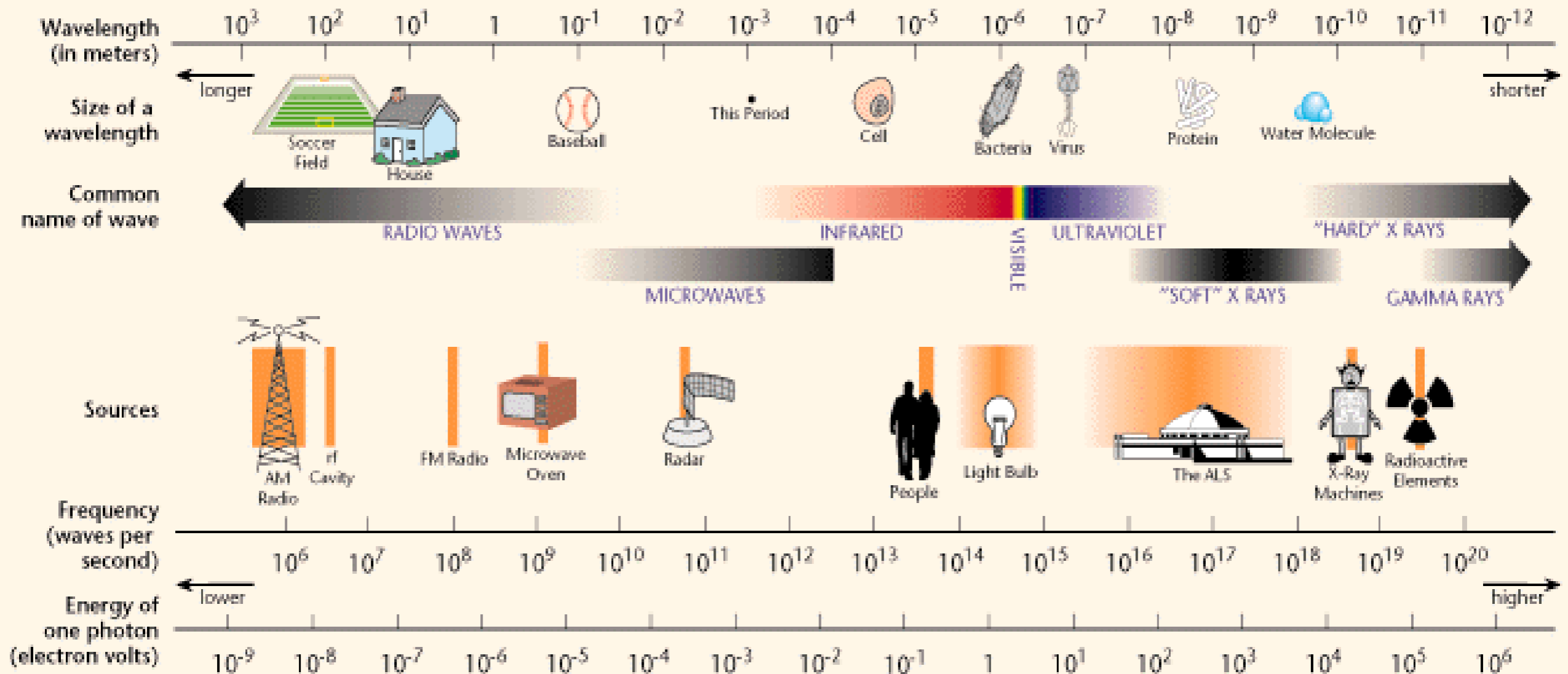


Injector

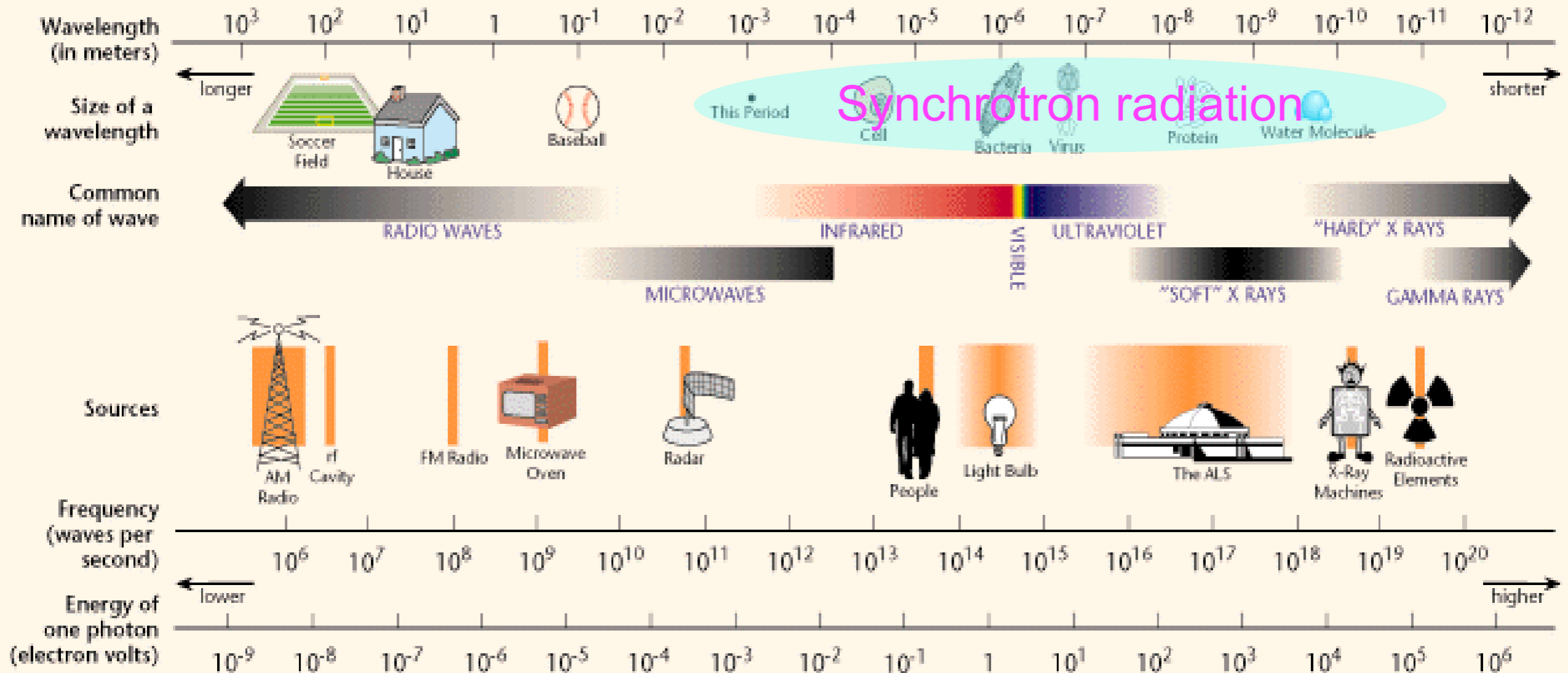
A synchrotron light source



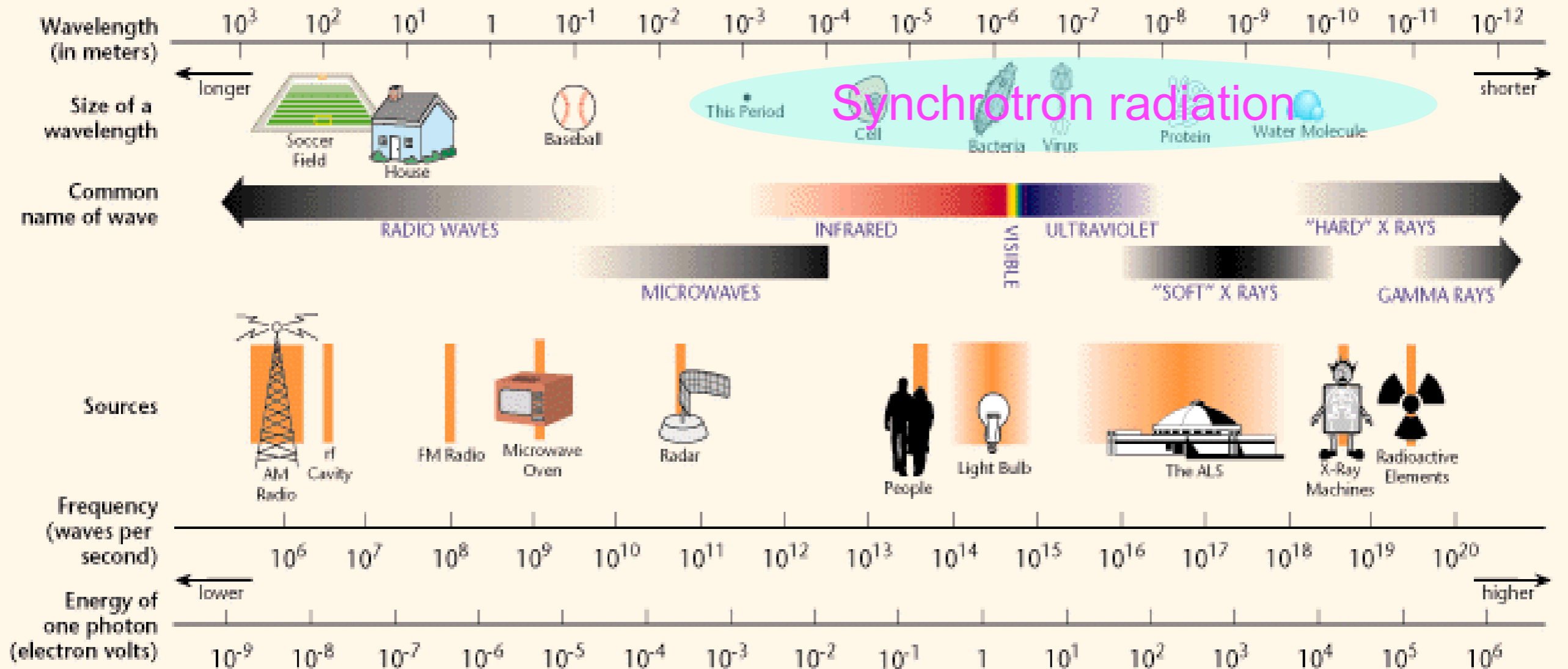
THE ELECTROMAGNETIC SPECTRUM



THE ELECTROMAGNETIC SPECTRUM

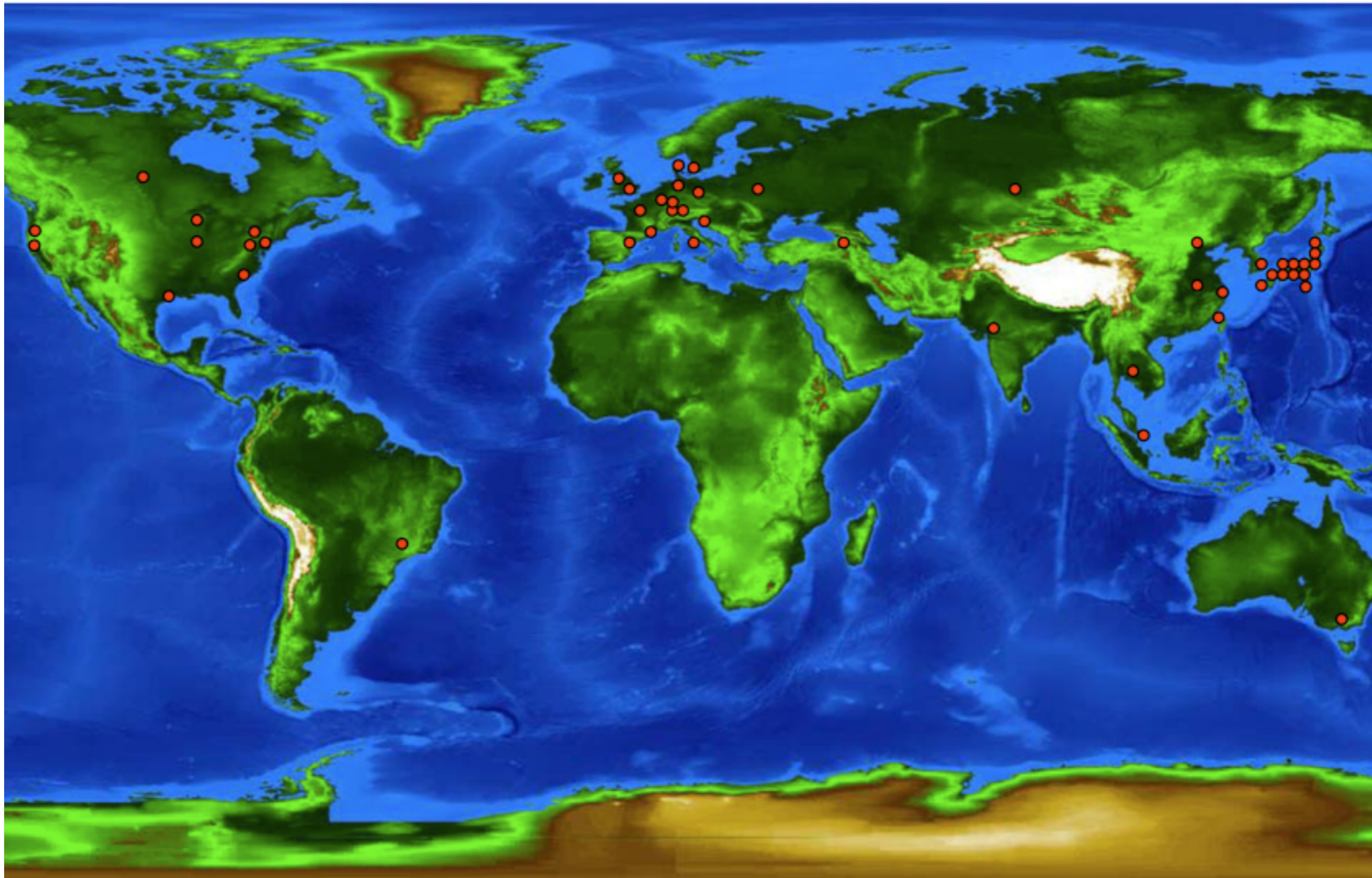


THE ELECTROMAGNETIC SPECTRUM

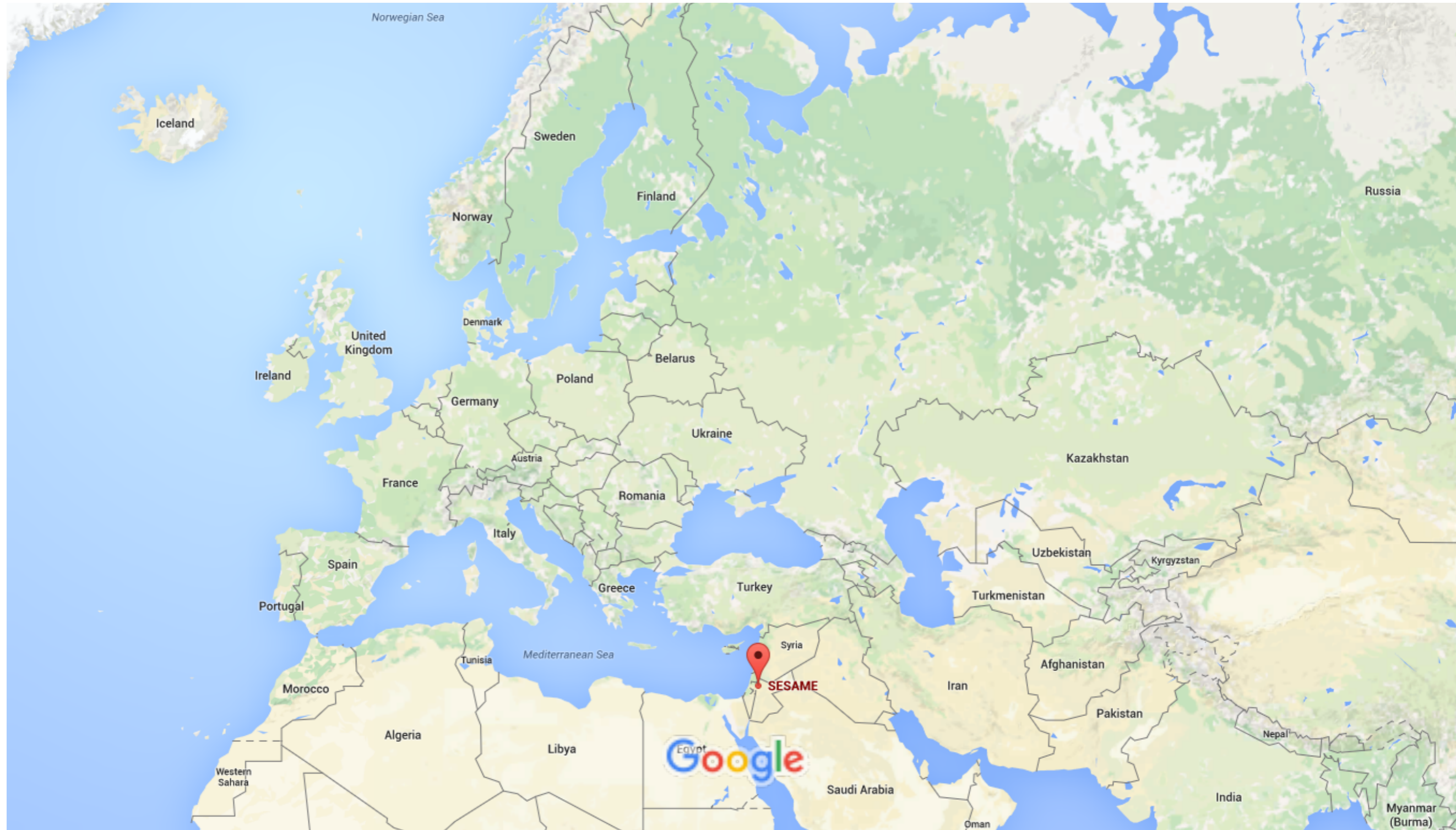


Synchrotron radiation

Distribution of SR sources



SESAME is in Jordan



Map data ©2015 Google, INEGI 500 km 

Location of SESAME



SESAME location in Allan, Jordan

The Laboratory



SESAME Members & Observers



Members:

Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestinian Authority, Turkey.

Observers:

Brazil, 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.



Members:

Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestinian Authority, Turkey.

Observers:

Brazil, 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.

SESAME is a third Generation Synchrotron Light Source

Original idea: rebuild an old German light-source (BESSY 1) in Jordan. The SESAME Members (most with very limited science budgets) joined with no obligation to provide capital funding. This idea was (correctly) abandoned (although refurbished parts of BESSY 1 will be used). Now building a new, competitive 3rd generation light-source which will attract the best scientists from across the region

Energy; **2.5 GeV**

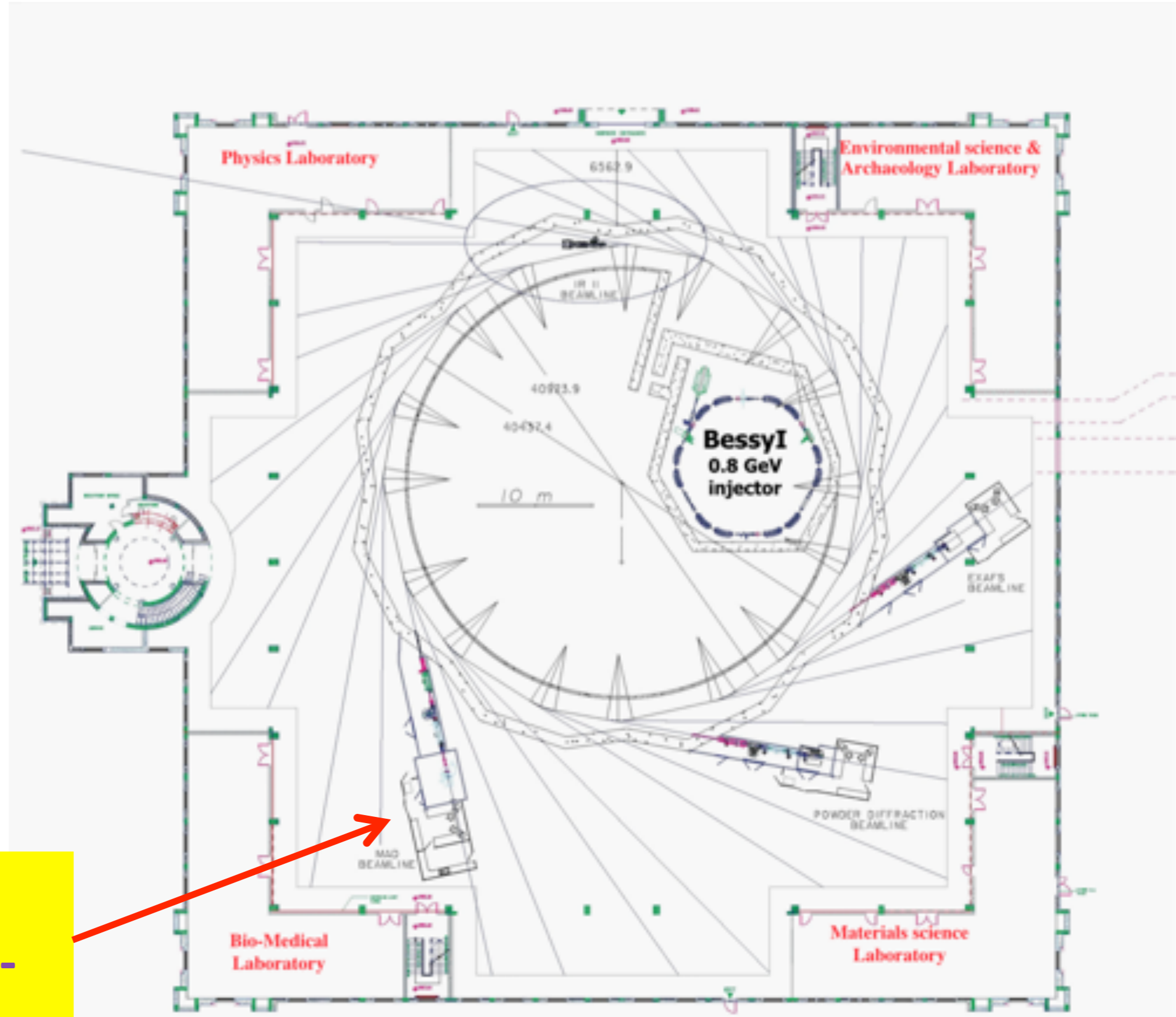
Circumference; **133m**

12 Insertion Devices

13 Bending Magnet
beamlines

Maximum beamline length;
37m

Space for future full energy
injector in main ring tunnel



**Beamlines focus
intense light (infra-
red to X-rays) on
experimental targets**

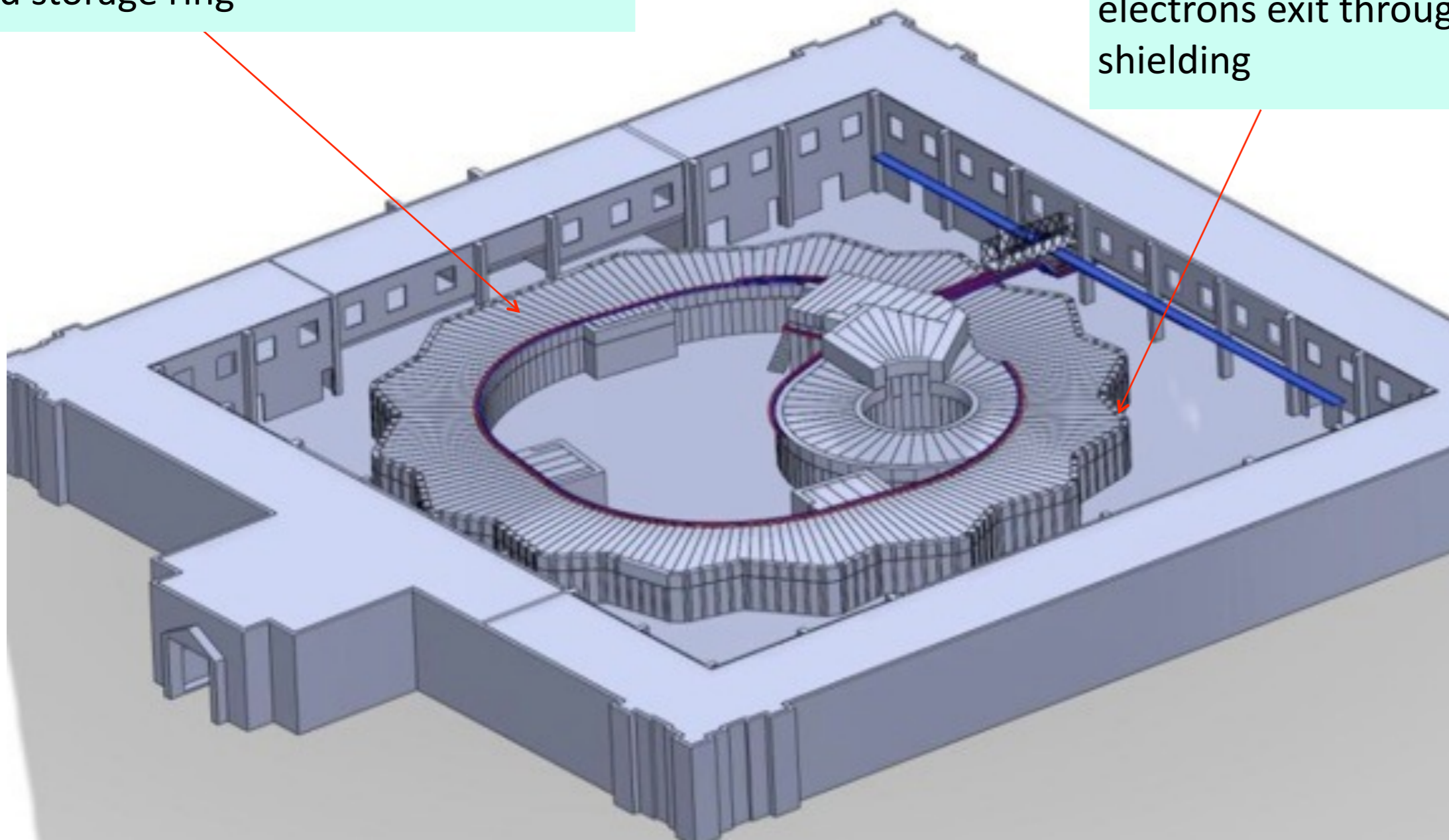
SESAME; *under construction in Jordan*

www.sesame.org.jo

Inside the SESAME Experimental Hall Schematic

Shielding houses electron accelerator and storage ring

Intense beams of light (infra-red to X-rays) generated by circulating electrons exit through ports in the shielding

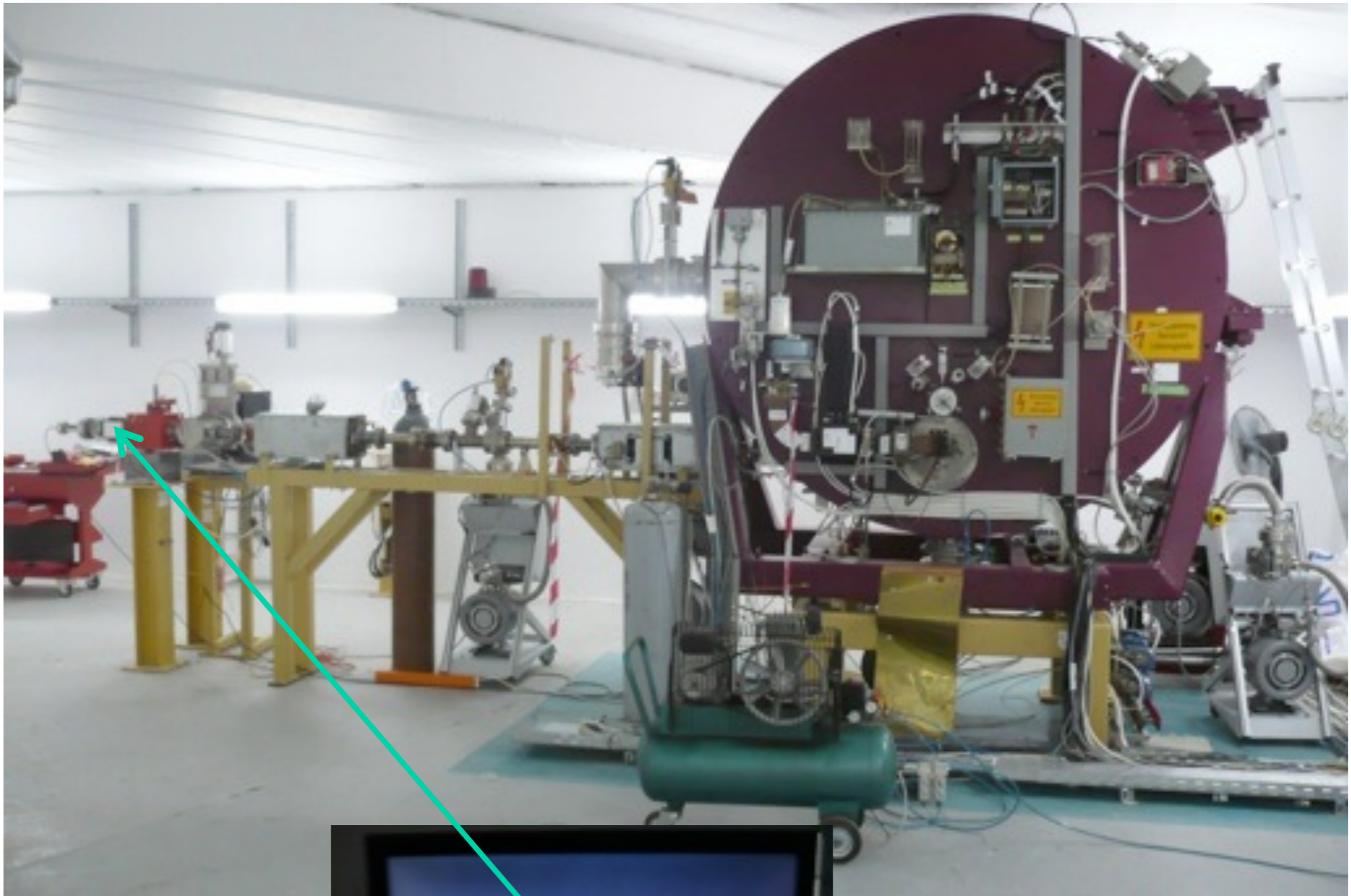




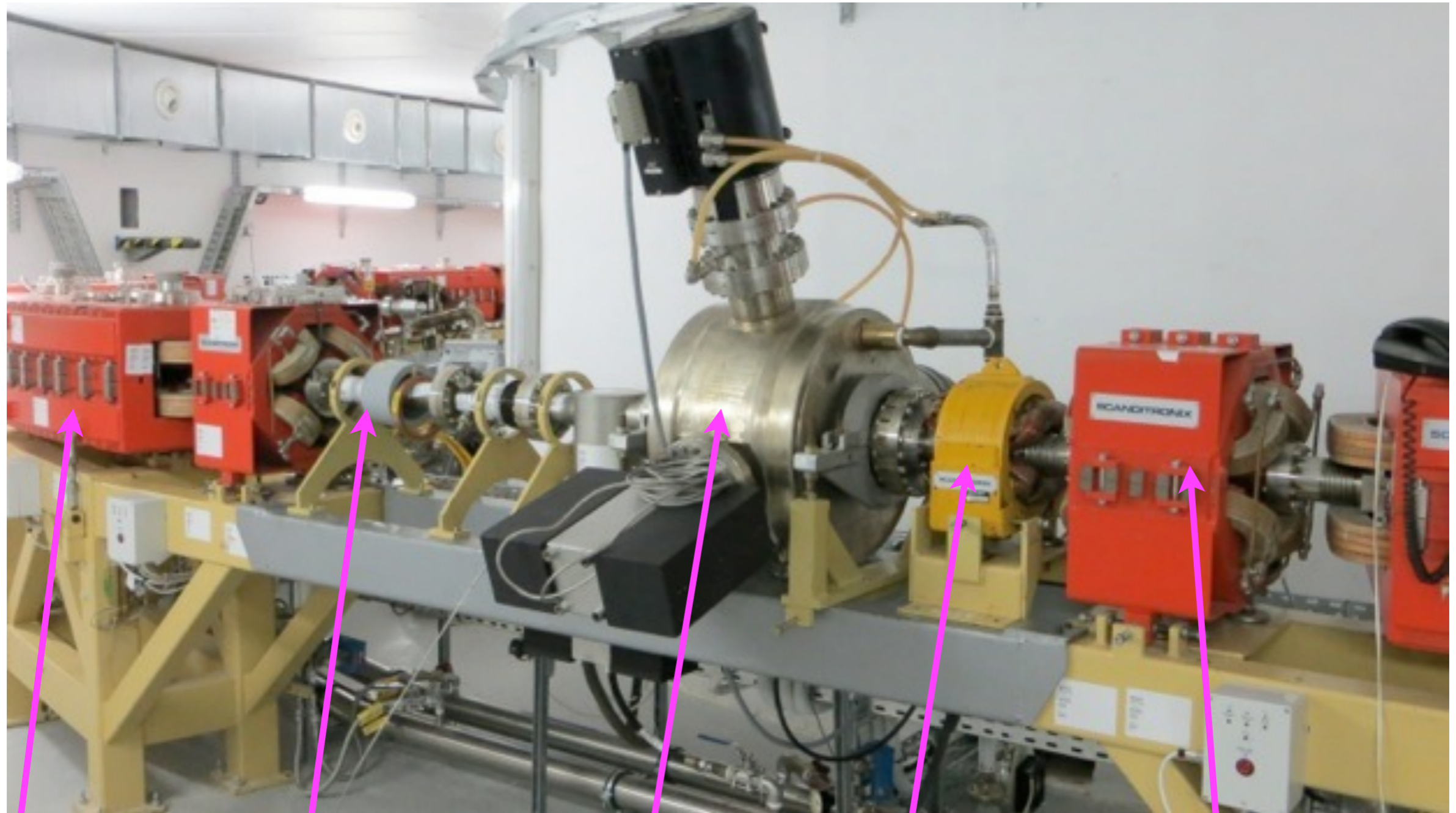
Shielding Completed, May 2011



Beam in the Transfer Line 1 – (2012)



Booster Installation



Dipole

Current Monitor

RF Cavity

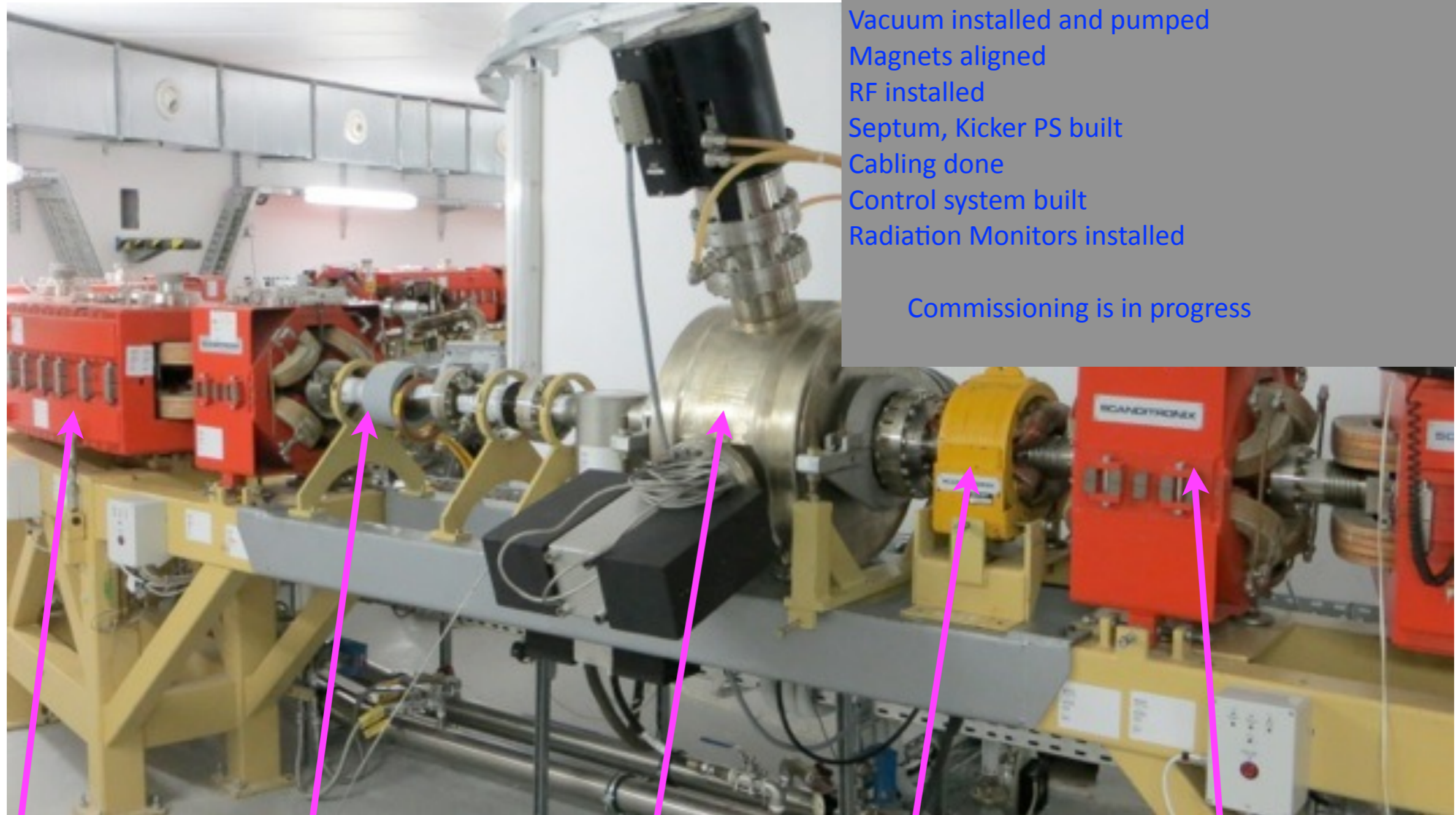
Corrector

Quadrupole

Booster Installation

Done:
Vacuum installed and pumped
Magnets aligned
RF installed
Septum, Kicker PS built
Cabling done
Control system built
Radiation Monitors installed

Commissioning is in progress



Dipole

Current Monitor

RF Cavity

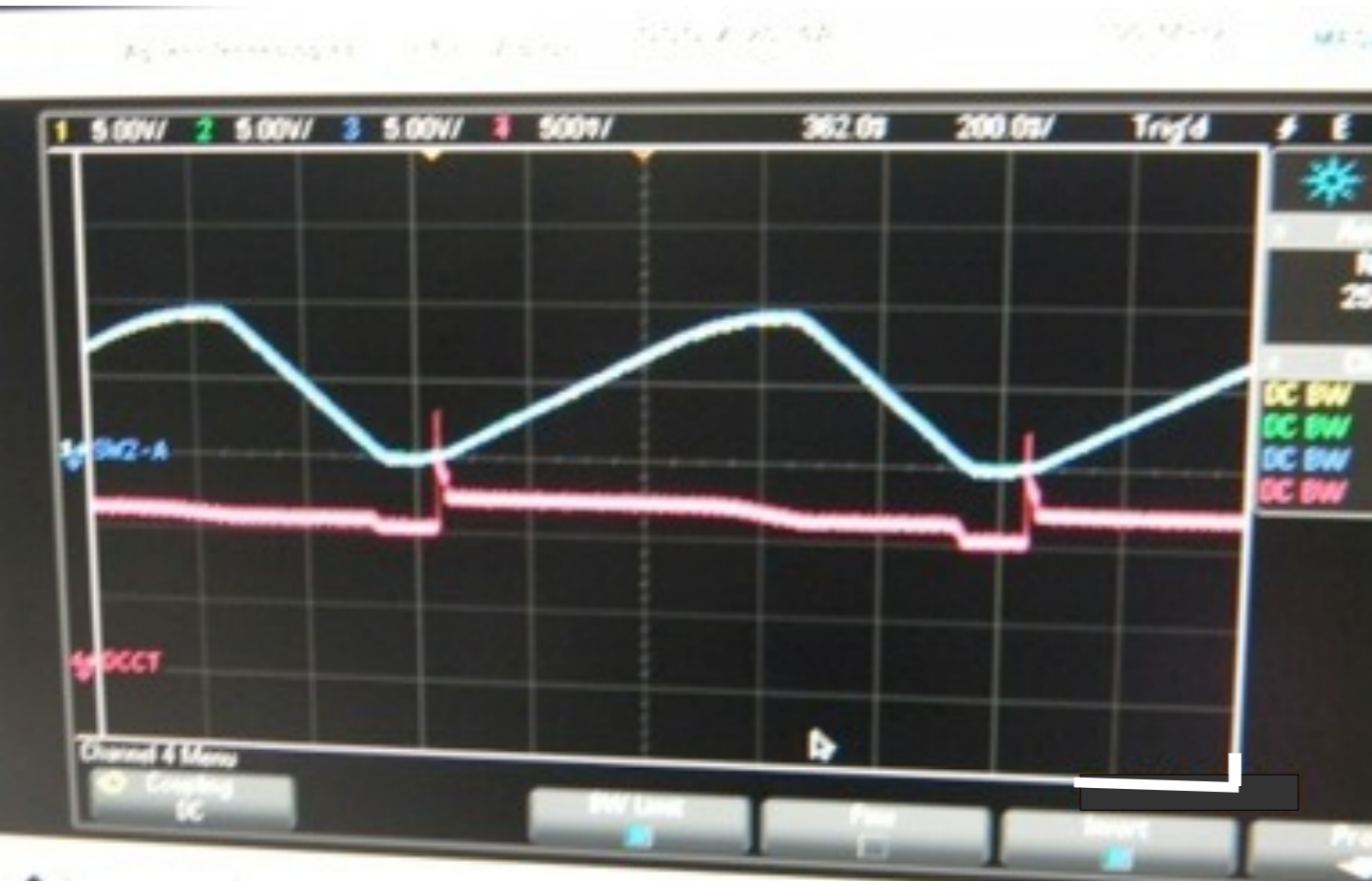
Corrector

Quadrupole



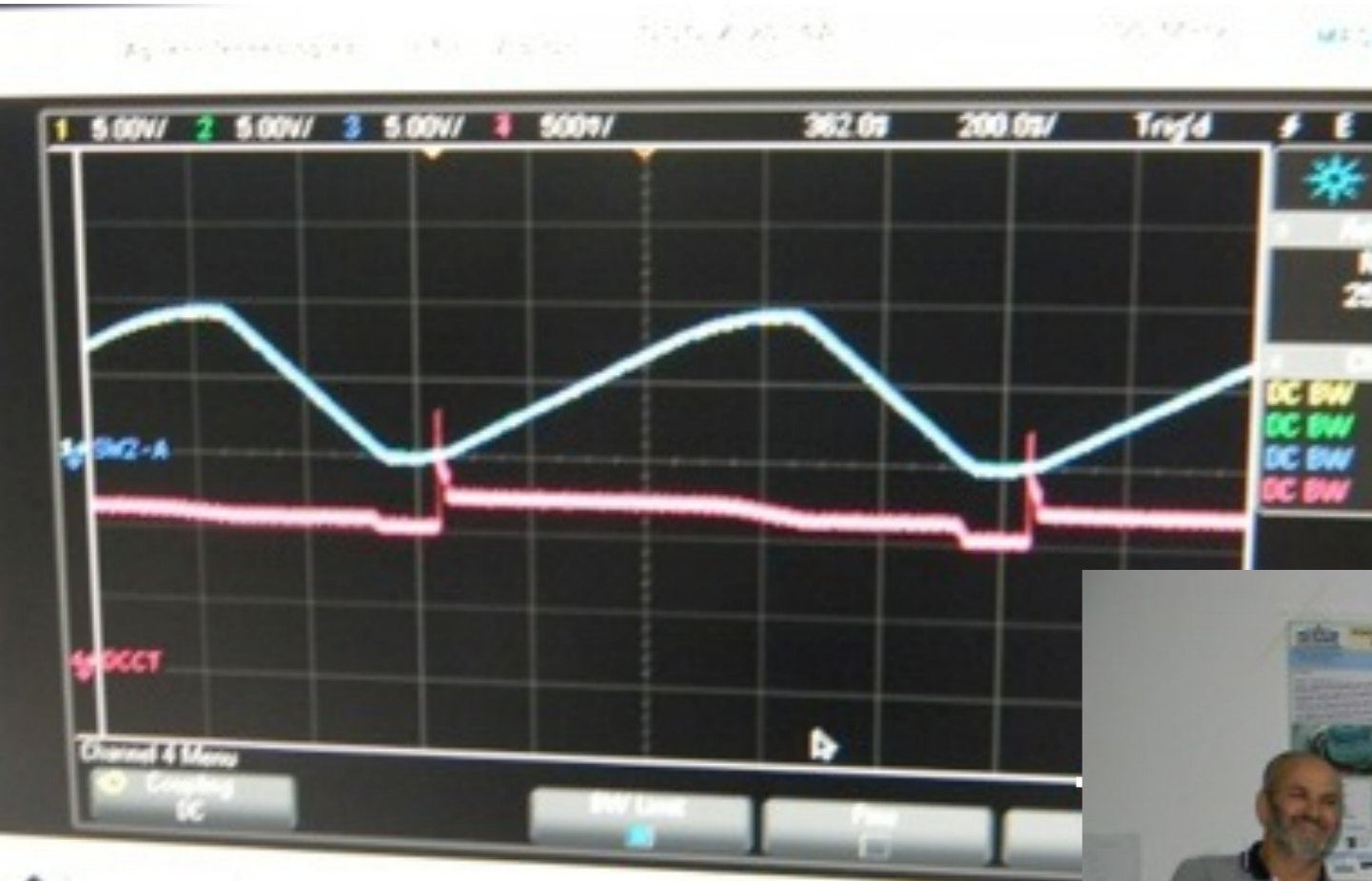
800 MeV Booster Beam Achieved on September 3, 2014

800 MeV Booster Beam Achieved on September 3, 2014



Control room monitor with 800 MeV, two injections appearing

800 MeV Booster Beam Achieved on September 3, 2014



Control room monitor with 800 MeV, two injections appearing



SESAME staff in the control room at the moment of achieving 800 MeV



- **SESAME
Facebook
page**

- **SESAME
Facebook
page**



SESAME shared a link.

Posted by Giorgio Paolucci [?] · 4 September

Very good news!

<http://sesame.org.jo/sesame/news/355-sesame's-800-mev-booster-synchrotron-is-now-in-operation.html>



SESAME's 800 MeV Booster Synchrotron is now in Operation

sesame.org.jo

SESAME - Synchrotron-light for Experimental Science and Applications in the Middle...

3,938 people reached

Boost Post

Unlike · Comment · Share

👍 19 🗨️ 5 ➦ 25 Shares



- **SESAME**
Facebook
page



SESAME shared a link.

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Very good news!

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sesame.org.jo

SESAME - Synchrotron-light for Experimental Science and Applications in the Middle...

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Unlike · Comment · Share

👍 19 💬 5 ➦ 25 Shares





A New Roof

Dec. 2013 Roof deflected by heavy snow load

Equipment protected from water

Roof supported by jacks and scaffolds

Jan.2014: Jordanian and International Expert-Commission assigned to investigate the accident

Mar. 2014: Report provided: Connection of diagonal trusses not appropriate designed further defaults during construction (lack of supervision)

Apr. 2014: Agreement SESAME –Constructor to reconstruct the roof

SESAME (Royal court) : 350 k JD fixed

Constructor remaining: ~ 700 k JD

May 2014-Apr 2015: Building of a new roof

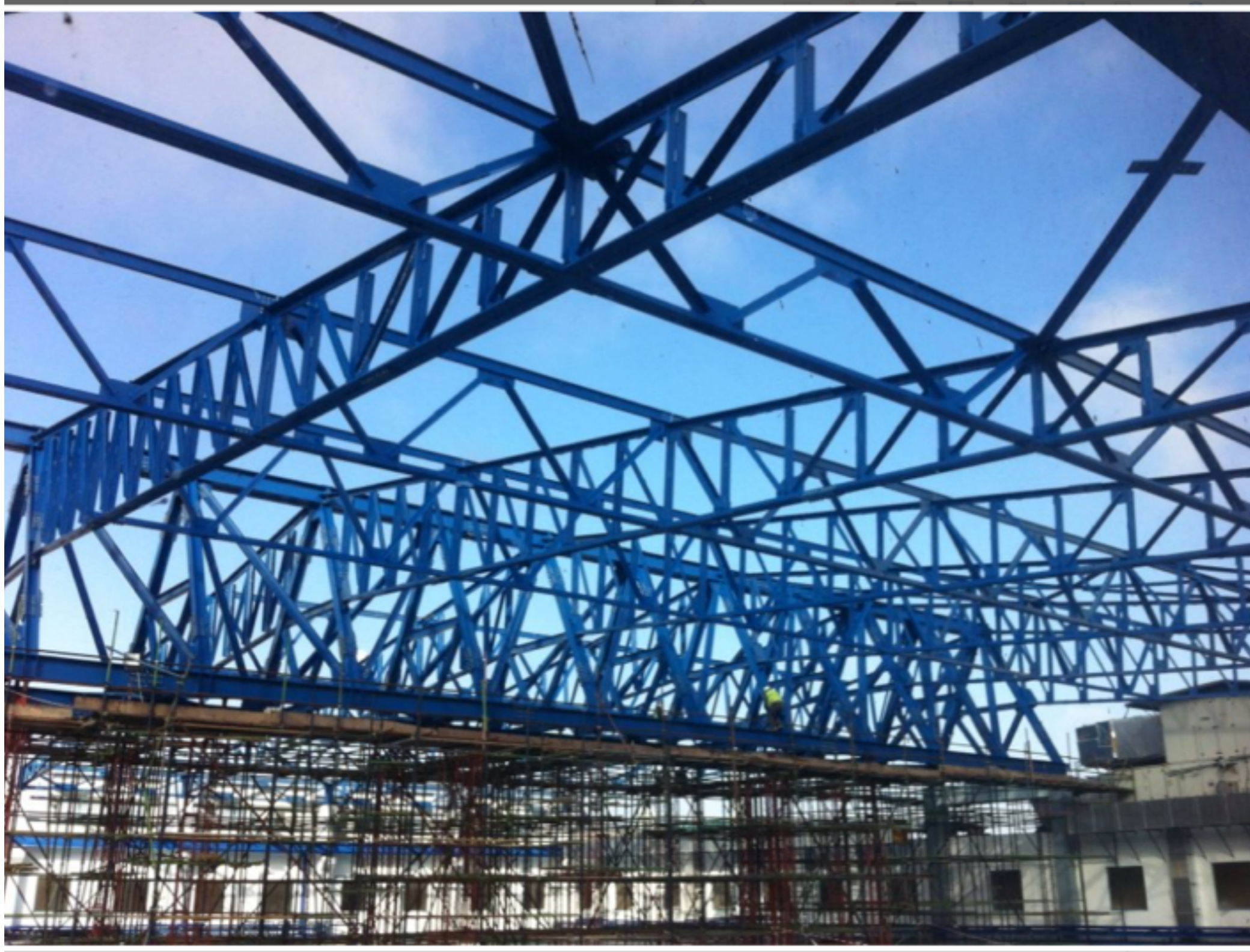
The Roof accident (Dec. 2013)



Towards a New Roof (Oct. 2014)



Towards a New Roof (Oct. 2014)



(Booster commissioned in THIS environment!)

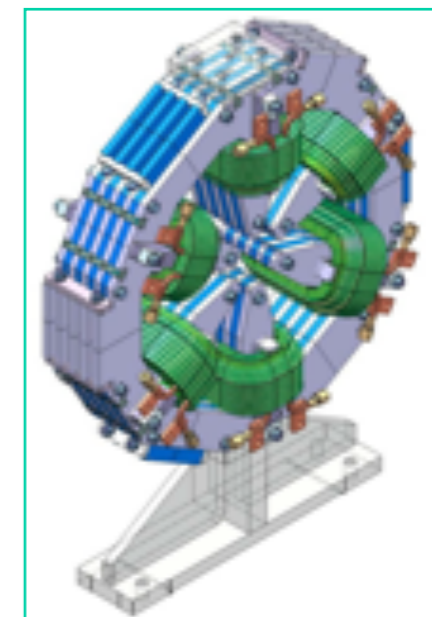
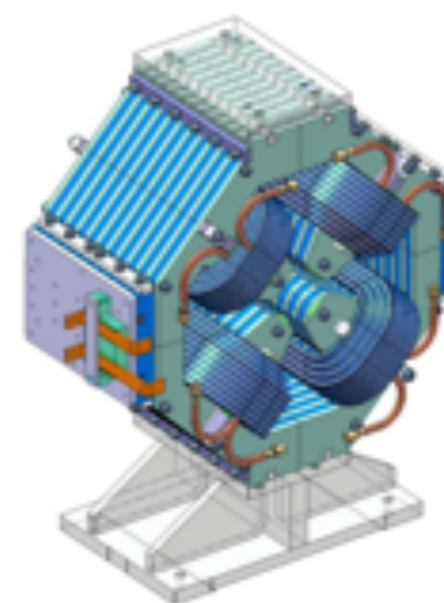
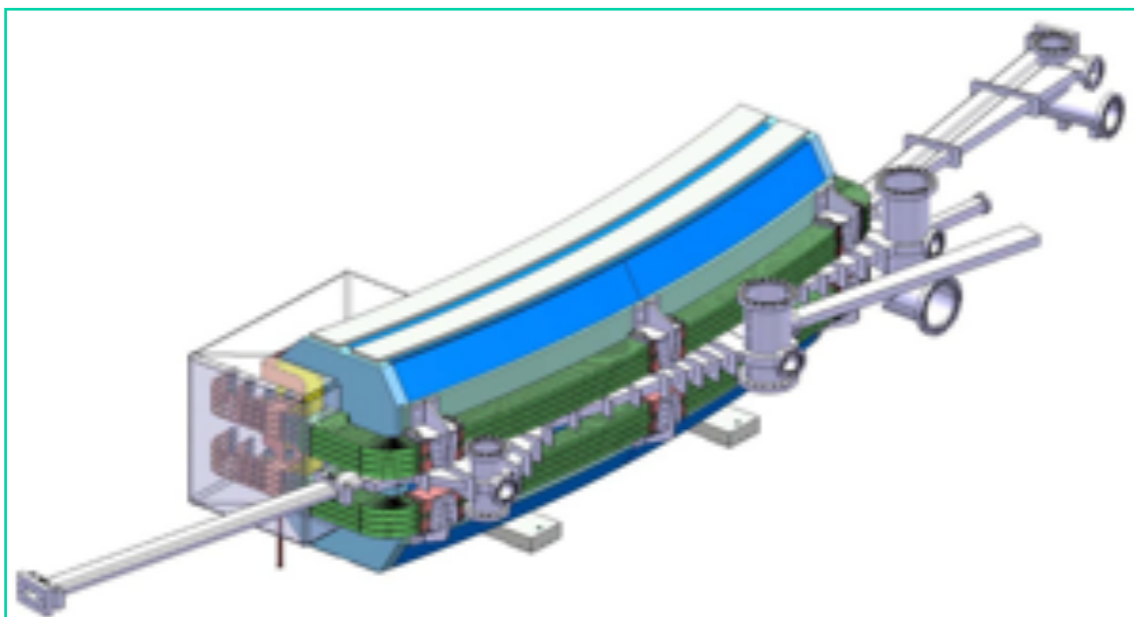




CESSAMag: Storage Ring Magnets

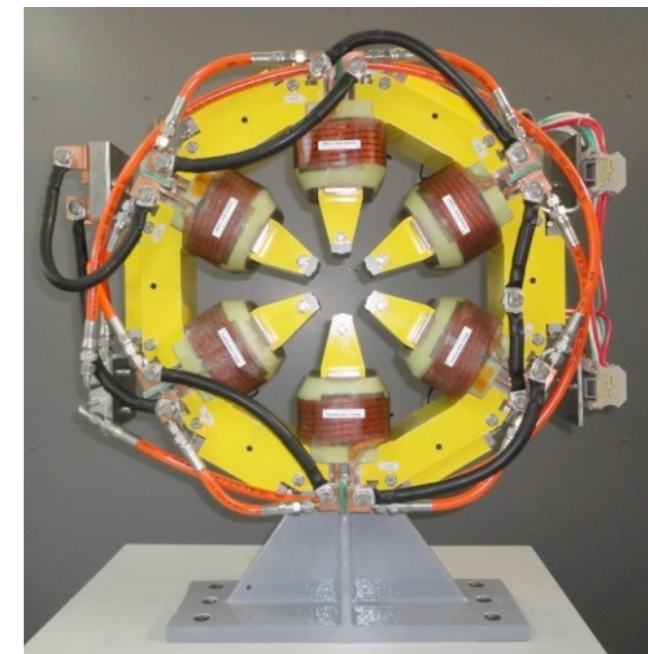
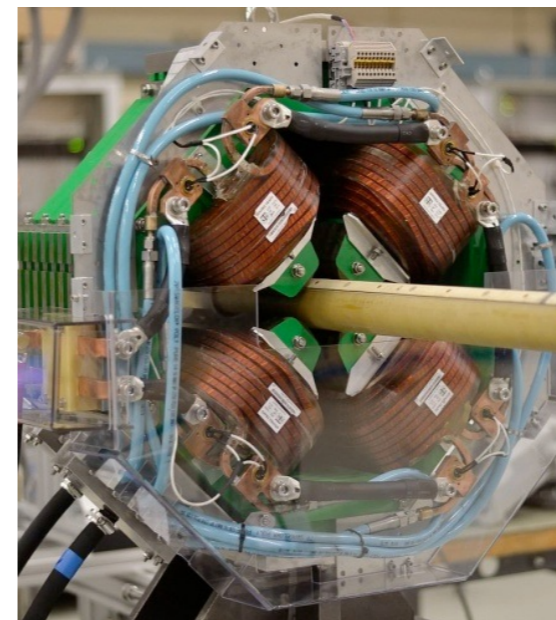
Project approved by EU:	May 2013
CERN-Tender request QP, DP:	Jul.2013
Opening of Bids	Aug. 2013
Contract award (DP: TESLA, QP: ELYTT)	Aug. 2013

Price for magnets allows power supplies to be financed (partially) within CESSAMag-Project



Storage Ring Status: Magnets

- ✓ Storage ring magnets are constructed through CESSAMag project in the frame of SESAME-CERN/EU collaboration.
 - ✓ Dipole (constructed by TESLA, UK) prototype is being magnetically measured at ALBA.
All dipoles to be delivered by Sep. 2015.
- ✓ Quadrupole prototype is being assembled (by Elytt-Spain, coils by STS-Turkey).
First batch to be measured at CERN by March 2015.
- ✓ Sextupole prototype (by CNE-Cyprus & HMC-3-Pakistan, coils by SEF-France) has been magnetically measured at CERN.
First batch to be measured at CERN by March 2015.



Storage Ring Status: Magnets



An engineer tests the installation of vacuum chamber and magnets for SESAME, at CERN's magnet-testing facility SM18 (Image: Maximilian Brice/CERN)

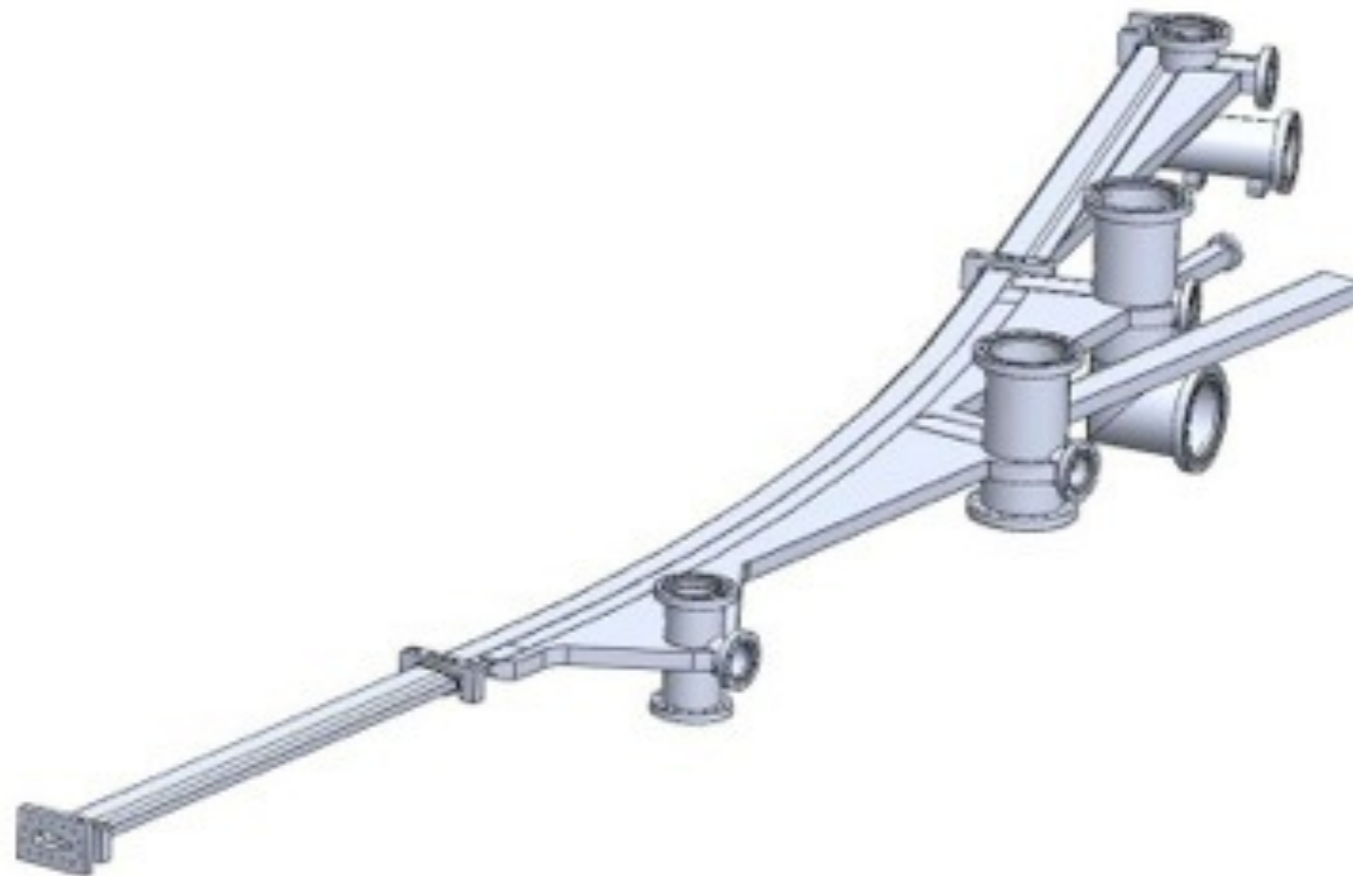
Storage Ring Vacuum Chamber

Invitation to Bid: Jun. 13

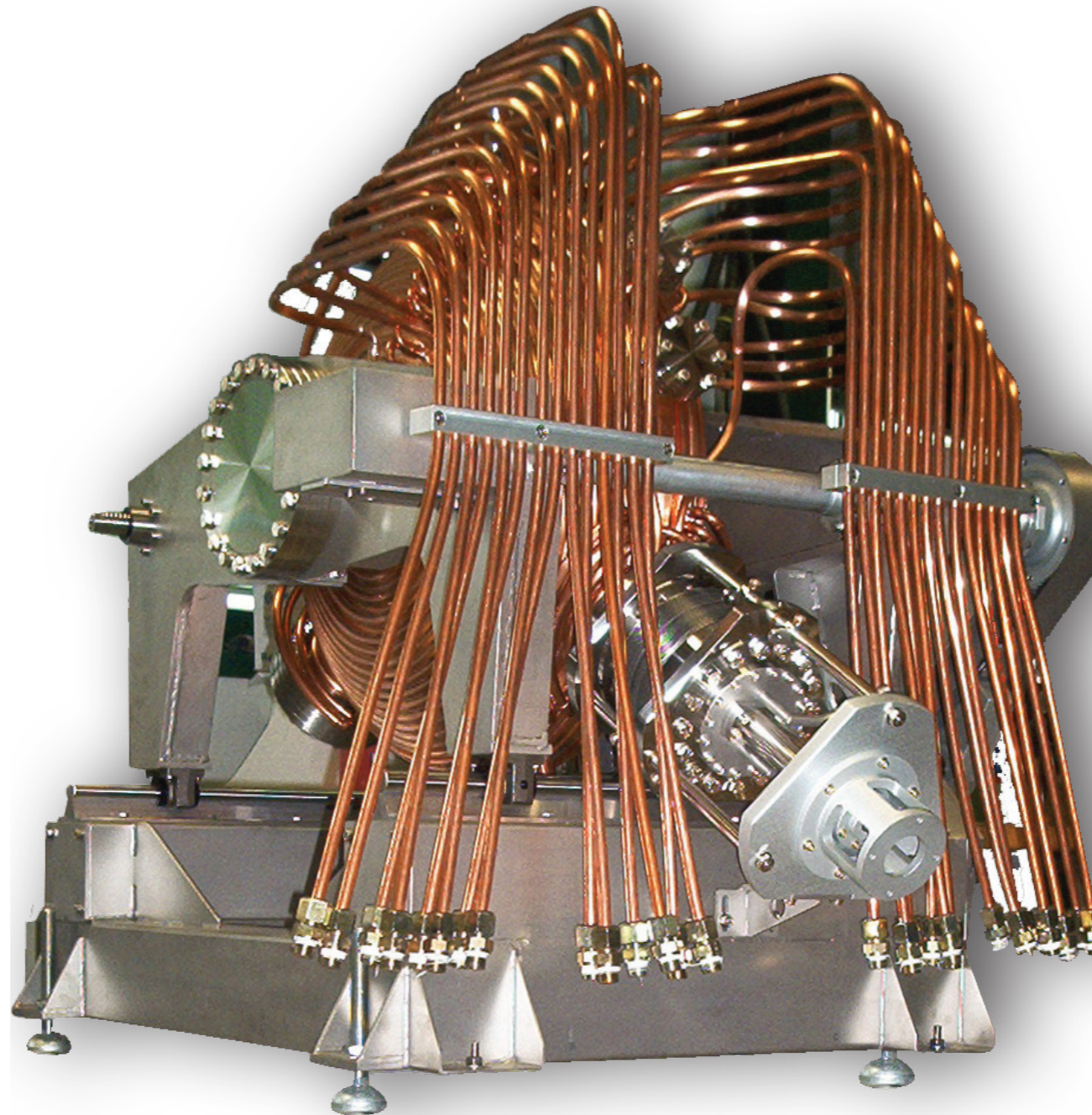
3 bids received : Aug. 13 (FMB, CECOM, FZJ)

Evaluation internal and external

FMB selected and contract signed Jan. 2014

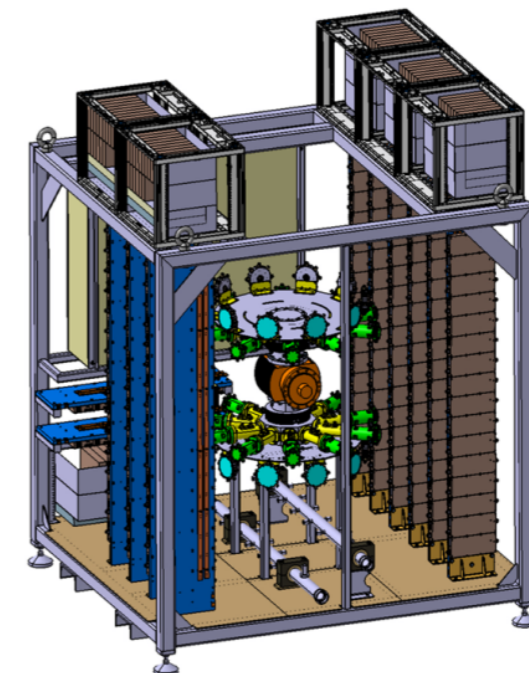
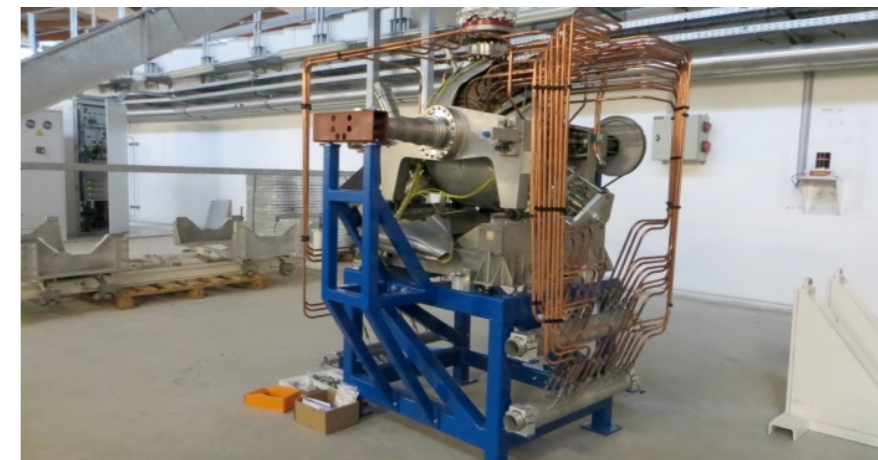
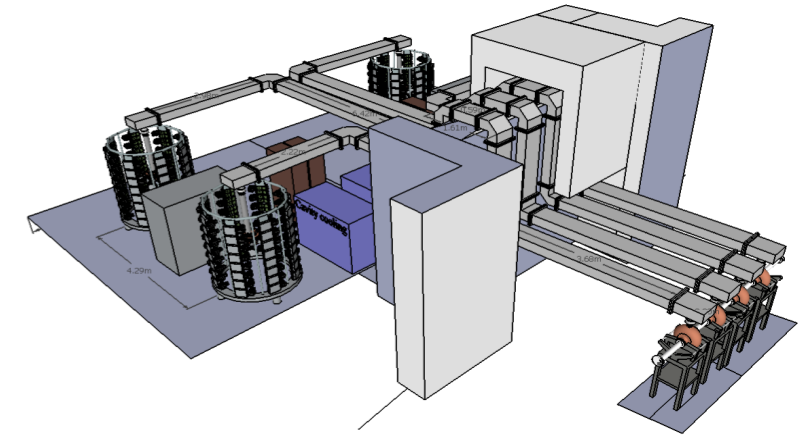


Storage Ring RF Cavities



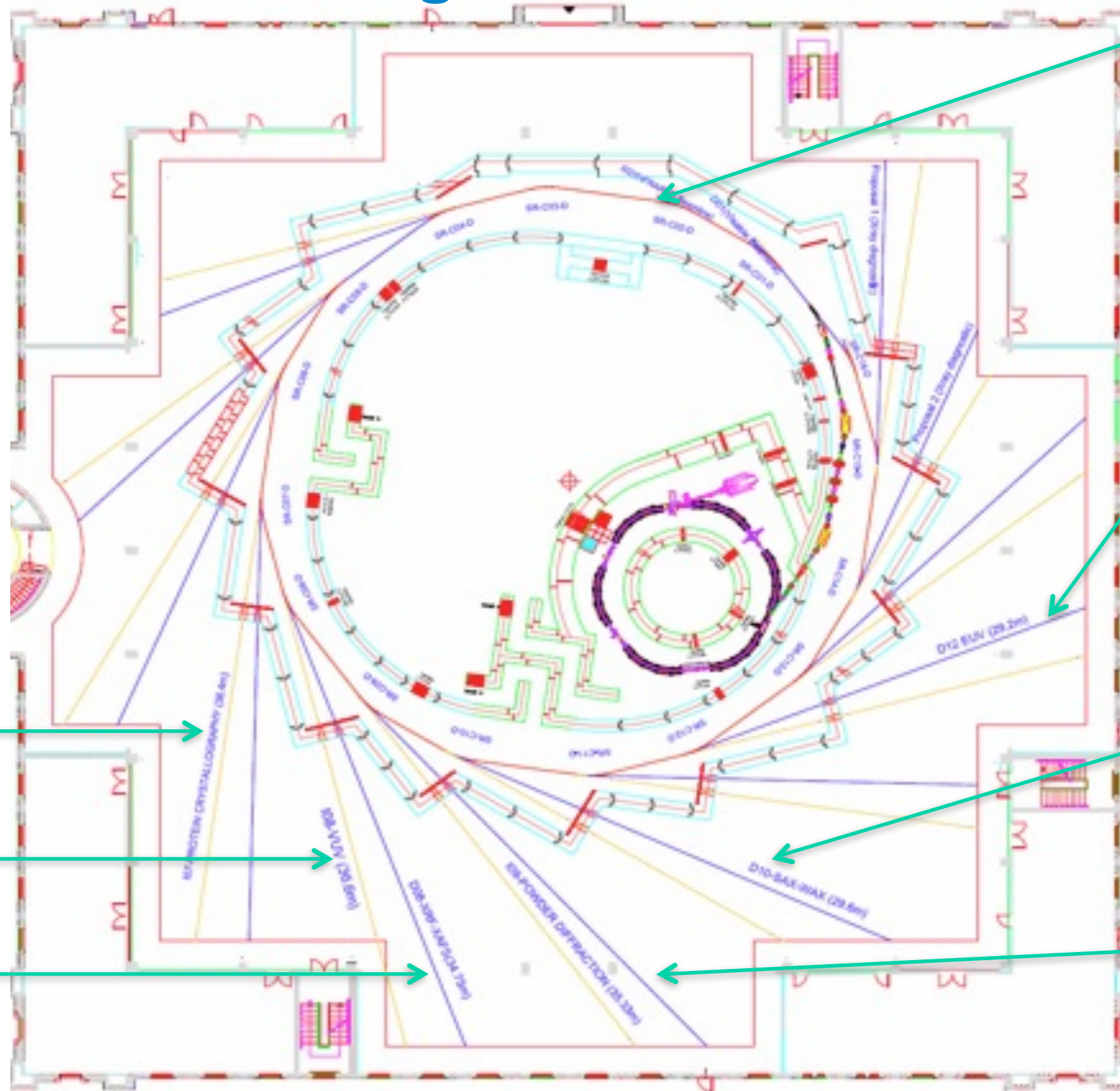
Agreement signed with INFN and Elettra in May 2014 (Financial support from the Italian Ministry of Education, University and Research). Under construction at Elettra.

- ✓ The 500MHz RF system is composed of 4 RF plants. Each plant composes:
 - 120kW Elettra cavity (detuned up to ± 2 MHz).
 - Collaboration agreement was signed with Elettra.
 - Delivery of 4 cavities foreseen by May 2016.
 - 80kW solid state amplifier (the 1st to be built by SOLEIL, the 3 others by Sigmaphi-SE).
 - Construction to start soon.
 - WR1800 waveguide (in kind contribution from DESY)
 - Digital LLRF (in the tendering process)



Courtesy
of SOLEIL

Layout of SESAME Experimental Hall Showing Phase 1 Beamlines



InfraRed

EUV BL

SAXS-WAXS

Materials science

Macromolecular Crystallography

VUV

XAFS-XRF

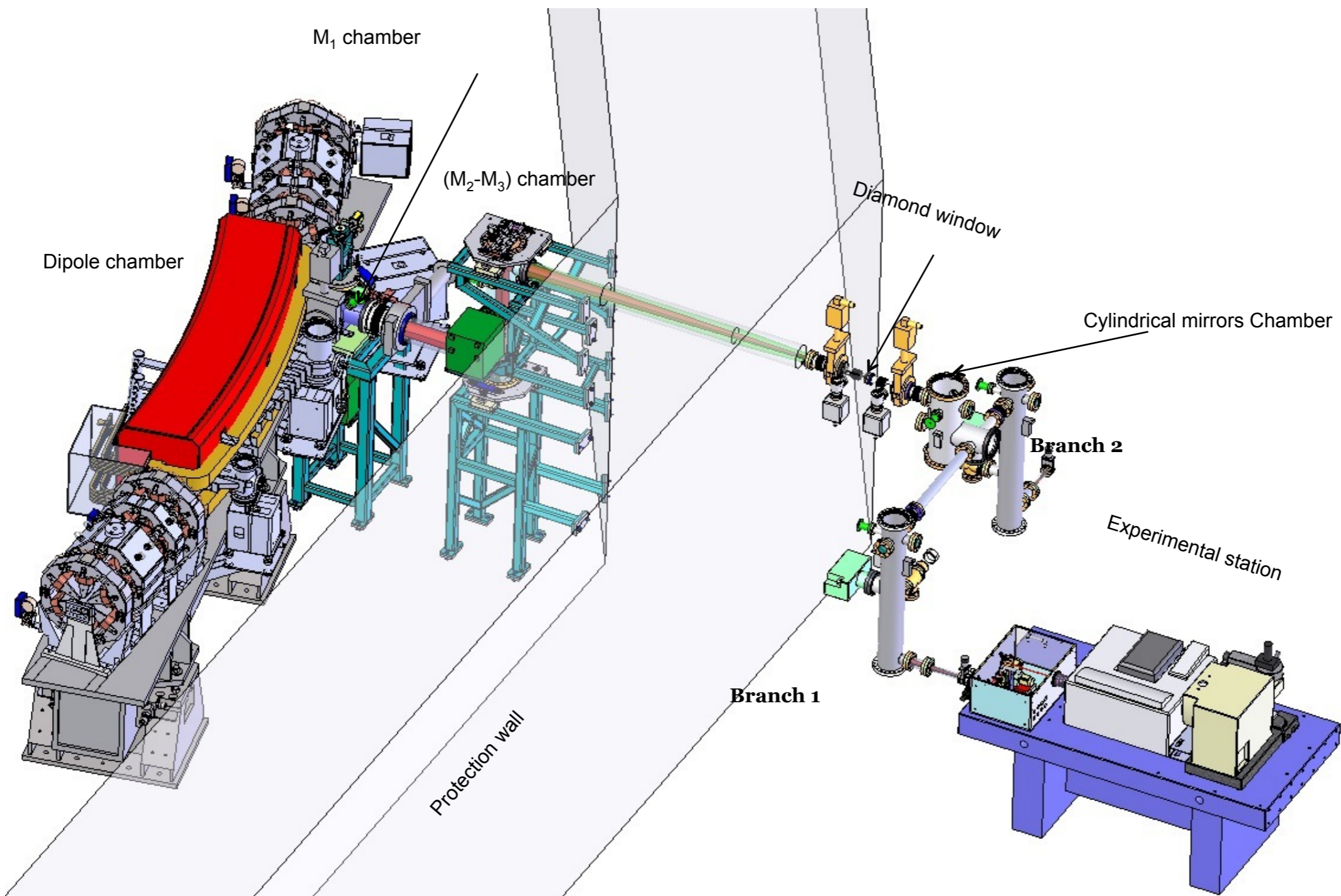
“Day-One” Beamlines

No	Beamline	Energy Range	Source Type	Comments
1	X-ray Absorption Fine Structure/ X-ray Fluorescence(XAFS/XRF)	3-30 keV	Bending Magnet	<ul style="list-style-type: none"> •Helmholtz-Zentrum Dresden-Rossendorf/ ESRF •New focussing optics •New Hutch
2	Infrared Spectro-microscopy	0.01-1 eV	Bending Magnet	<ul style="list-style-type: none"> •Mod to storage vacuum chamber •New beamline
3	Materials Science	3-25 keV	2.1 Tesla MPW (SLS)	SLS XO4SA
4	Macromolecular Crystallography	4-12 keV	IVU	New



IR Beamline

Integrate the Beamline 3D drawings with SESAME general drawing



The IR microscope





IR Beamline

Agreement with SOLEIL

A scientific cooperation agreement is going to be signed to have the BL provided by SOLEIL

New BL scientist

A new, experienced BL scientist (Gihan Kamel, Egypt) joined SESAME

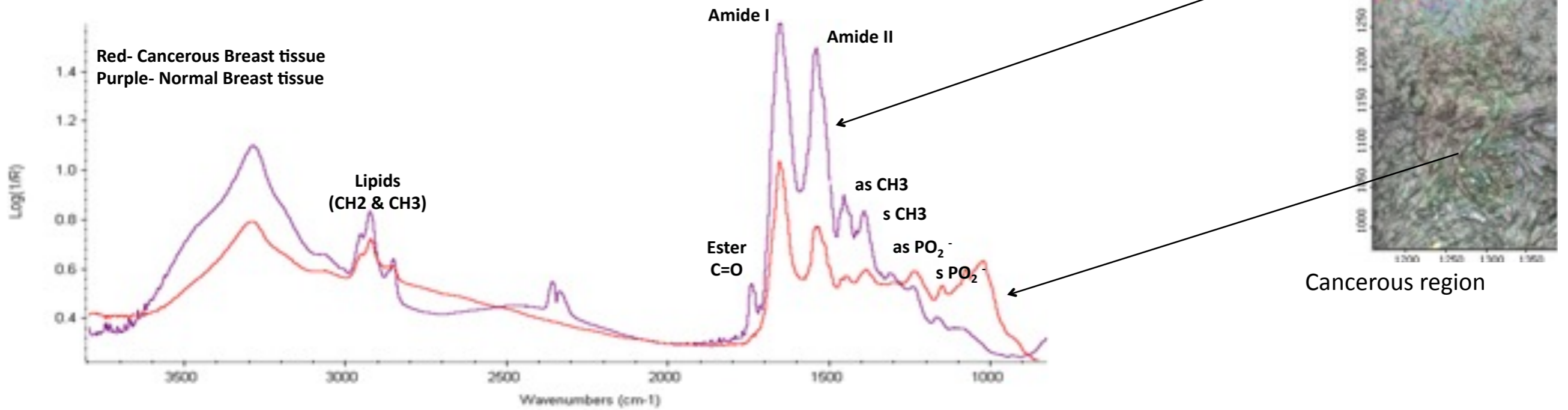
IR Call for Proposals

- Posted on SESAME website February 25-2013
- Last date for submission of proposal June 15-2013
- **Peer Review Committee:**
 - Lisa Miller: Beamline Scientist – NSLS
 - Ulrich Schade: Beamline Scientist- BESSY II
 - Lisa Vaccari: Beamline Scientist - ELETTRA
- Each Proposal was reviewed by two members of the Committee, who provided a score and a comment

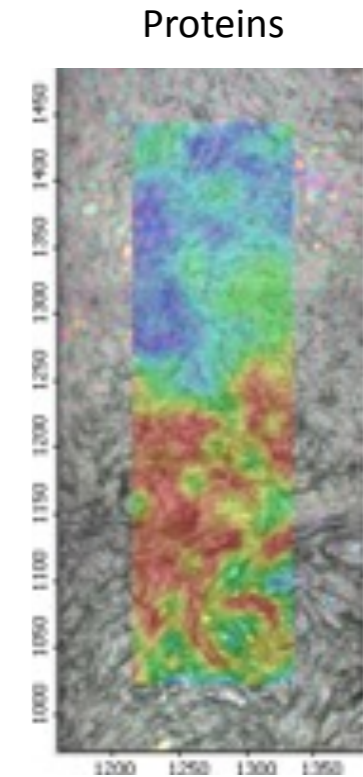
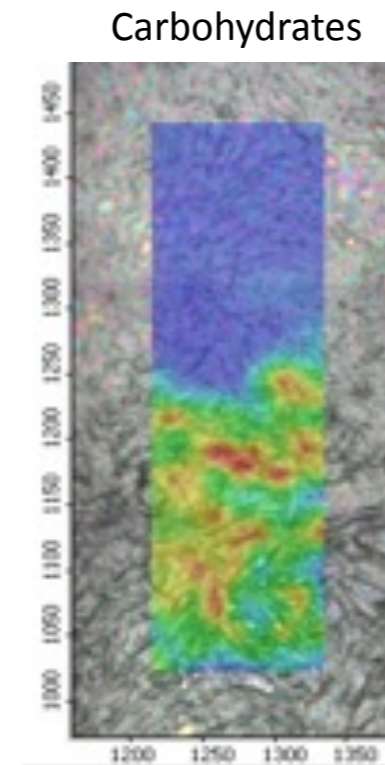
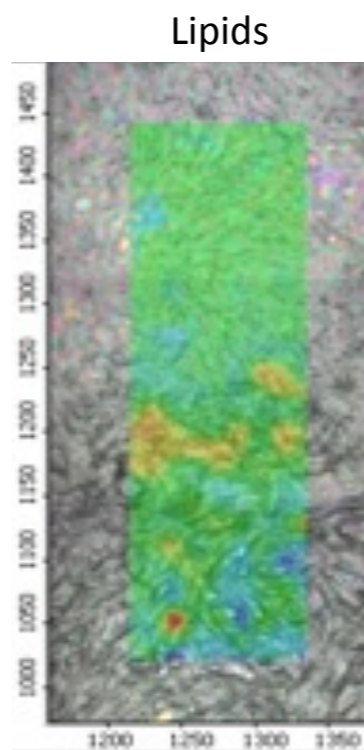
Collaborative projects with scientists from the Middle East:

- FTIR analysis of breast cancer from Iranian patients: collaboration from Tehran University, **Iran**.
- FTIR analysis of bacterial and marine micronutrients: Collaboration from the University of **Pakistan**
- Study effects of pharmaceutical products on different skin layers by of infrared spectromicroscopy: collaboration the university of Jordan, **Jordan**.
- Effect of environmental pollution on the edible, medicinal and aromatic plants grown in Jordan: faculty of pharmacy, university of Jordan, **Jordan**.
- Investigation on diamond like carbon deposited on Si wafer using the FTIR microscope equipped with a grazing angle objective: collaboration with Ministry of Science & Technology. Baghdad, **Iraq**.
- FTIR analysis on organic samples, which have promising pharmaceutical applications, combinatory analysis using powder diffraction: collaboration with Physics Division, National Research Center Cairo, **Egypt**.

FTIR analysis of breast cancer from Iranian patients: collaboration with University of Mazandaran, Iran.




Chemical Maps showing the distribution of some biochemical components inside the Breast Tissue.



FTIR analysis of breast cancer from Iranian patients: collaboration with University of Mazandaran, Iran.

Staff Login | English | Svenska



Search... 

First user visit from SESAME to MAX IV

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FIRST USER VISIT FROM SESAME TO MAX IV

2014-09-01



Ibraheem Yousef (SESAME), Enam Khalil (JU) and Randa Mansour (JU) together with Anders Engdahl in the measurement hutch of D7.



XRF/XAFS Beamline



XRF/XAFS Beamline

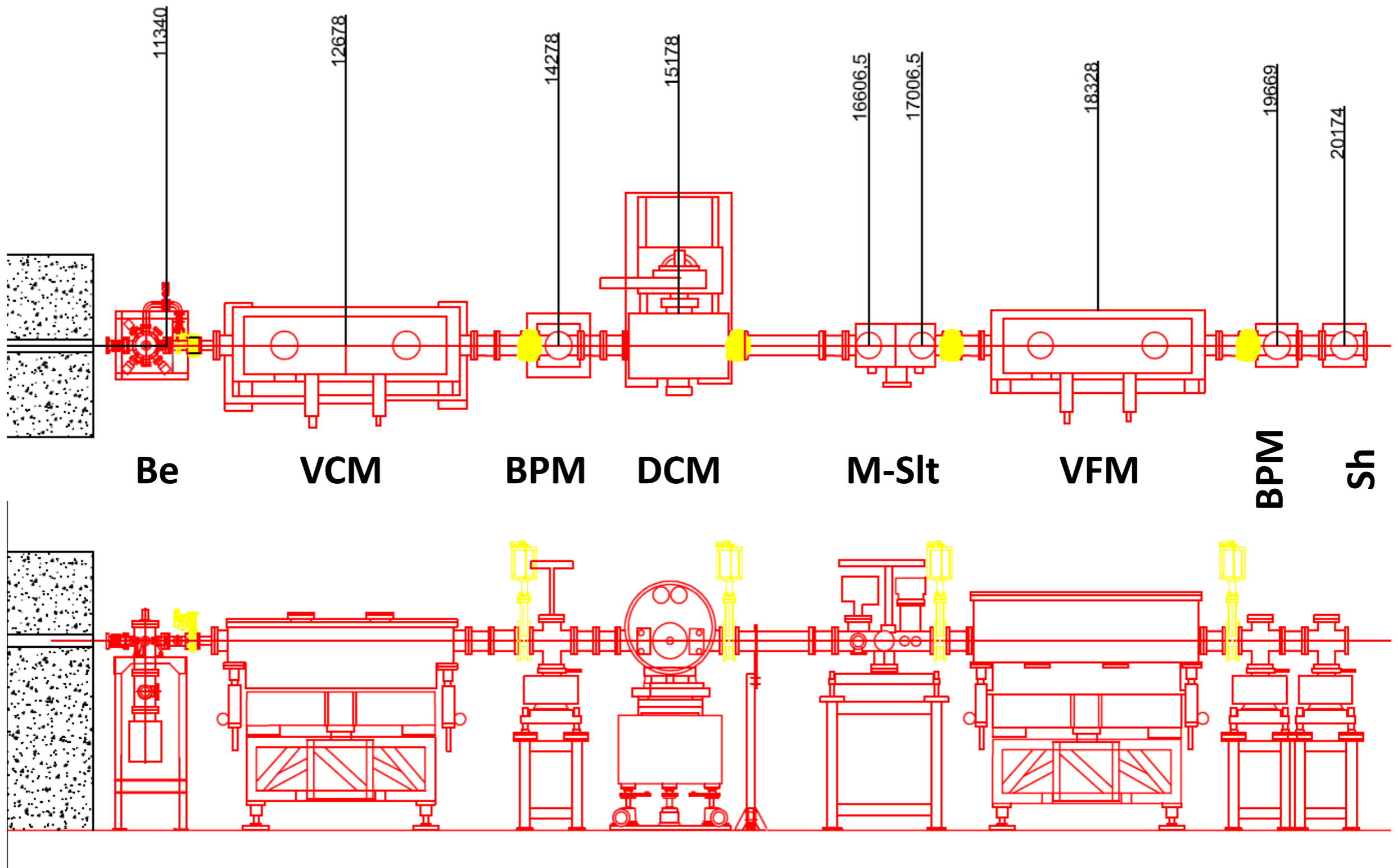
XRF/XAFS Beamline

- Progress made:
 - CDR Completed
 - Two reviewers: Tom Ellis (CLS) & S. Ferrer (ALBA)

“The conceptual design written by M. Harfouche addresses most of the issues relative to the beamline in an appropriate way. The report is good and useful.”

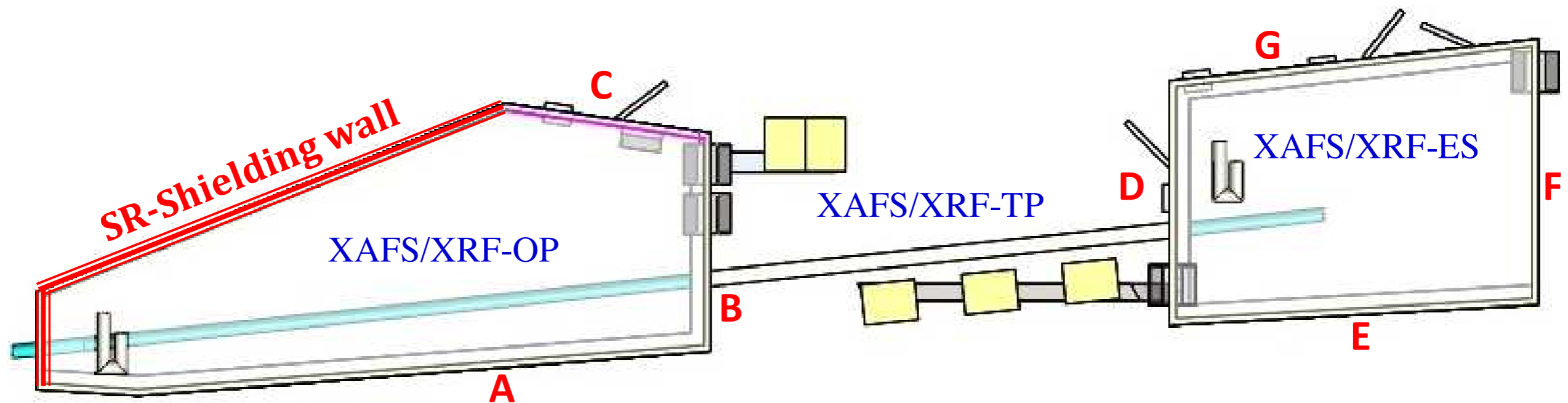
- 2013: Visit to Elettra for commissioning of XRF BL
- 2013: Visit to Liverpool University 6 element Ge
- 2015: Call for tender for the X-Ray safety hutches (expected to be ready in Spring 2016)

Beamline Layout



XAFS/XRF Beamline

XAFS X-Ray safety hutches



XAFS/XRF Beamline

XAFS X-Ray safety hutches

- Design based on the ESRF standard
- Agreement (based on the existing MoU) with ESRF to provide SESAME with technical drawings for the purpose of the tender
- Tender for X-Ray safety hutches published on March 28.
- Interest from experienced companies.
- Paul Berkvens (ESRF expert) visited SESAME (IAEA expert visit) in the period June 29 - July 3 week to give advise on the technical evaluation of the offers
- Contract signed on August 3.

XAFS/XRF Beamline

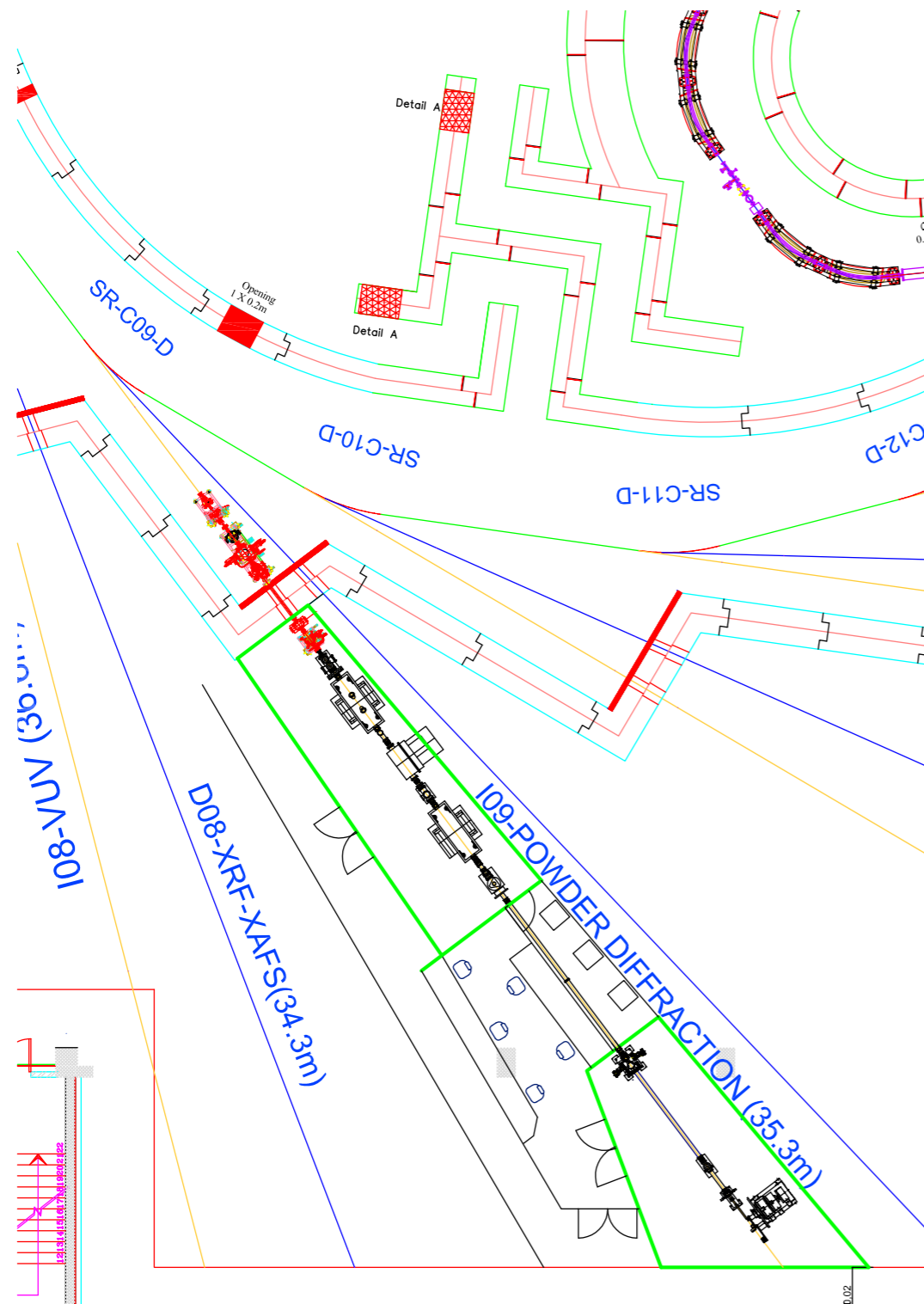
XAFS Fluorescence detector

Contacts with INFN to use part of the Italian contribution for an innovative Si-drift detector.

It is expected that the new detector will have a sensitivity at least an order of magnitude higher than existing technology.

Beamline Components





New MS BL scientist
hired:
Mahmoud Abdellatif
(Egypt)



Macromolecular Crystallography

A joint SESAME-Jordan University proposal has been submitted to the Jordanian Scientific Research Support Fund:

- In Vacuum undulator based
- Cryo-cooled Monochromator
- Low divergence/High focus options
- Robot for sample handling
- High performance photon counting detector (e.g. Dectris Pilatus 6M)

Combined with a protein expression/crystallization facility

Remaining Phase I Beamlines

No	Beamline	Energy Range	Source Type	Comments
5.	Soft X-rays	0.05-2 keV	Elliptically Polarizing Undulator	New BL
6.	Small- and Wide-Angle X-ray Scattering SAXS/ WAXS	8-12 keV	Bending Magnet	Daresbury 14.2
7.	Extreme Ultraviolet	10-200 eV	Bending Magnet	Daresbury 4.1 & Lure



Optics Laboratory

An optics laboratory for the characterisation of BL component will be proposed to the next Council Meeting

Expert in X-Ray optics recently hired (Hosein Khosroabadi from Iran)

Training Programme

- Users Meetings, Workshops, Individual Training (Visits, Fellowships..)

- Funding from

International Organisations: IAEA, UNESCO, ICTP, ESRF

External National Organisations & Synchrotron Labs: Brazil, France, Germany, Italy, Japan, Portugal, Spain, Sweden, Switzerland, Taiwan, UK, USA (DoE)

Organisations from Member States: Cyprus, Egypt, Iran, Israel, Jordan, Turkey

Scientific Societies: APS + EPS + IOP + DPG + ACS + NAS

Foundations: Canon, Lounsbery

LinkSCEEM Project (Cyprus): ***High Performance Computing (HPC) in the Eastern Mediterranean Region***

Topics include: Accelerator Physics , Beamlines, Scientific Applications



International Support

ANKA, Germany

Brazilian Light Source, Brazil

Elettra, Italy

ESRF, France

Daresbury Laboratory, UK

DESY, Germany

LURE, France

MAX-Lab, Sweden

Swiss Light Source, Switzerland

ALBA-Cells, Spain

Diamond, UK

Taiwan Light Source, Taiwan

SOLEIL, France

UNESCO

DoE, USA

IAEA

ICTP

APS-EPS-IoP-DPG -SIF

JSPS

Portugal

Canon Foundation

Lounsbery Foundation

ICTP - SESAME M. Sc. Fellowships for 2014

The Abdus Salam international center for theoretical physics based in Trieste, Italy under a collaboration program offering two Master Thesis fellowships of six months.

- Call for application published in February
- 11 applications received (5 from Jordan, 6 from Palestinian Authority)
- Process of selecting two candidates is being carried out

External Support for SESAME

- **Advice** – from members of Advisory Committees and visits
- **Equipment** (or cash for equipment) – several donations of equipment and donations of cash to build equipment.
- **Training** (Users' meetings, Workshops, Individual training - Visits, Fellowships,...) - one of the essential objectives of SESAME, supported by laboratories and organizations around the world, including the USA

Conclusions

There are challenges

Stable financial support; attracting new members from the Gulf and the Mahgreb (**new members are welcome**); making up for the shortage in the human and financial resources of the members; solving problems involving travel restrictions; finding funding for provision of full energy and current, conference centre, full suite of Phase I beamlines,.....

But great progress has been achieved

SESAME is working politically and technically

The training program is building capacity in the region

The voluntary contributions (agreed March 2012) constitute a major step forward and make it possible to plan for commissioning to begin in 2016.