The SESAME Project

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OVERVIEW

- **This talk gives:**
  - **Introduction**
  - **Reasons and Objectives**
  - **Historical Perspective**
  - **Capacity Building Efforts**
  - **Summary**

SESAME

Synchrotron light for
Experimental
Science and
Application in the
Middle
East

An International Research Center
for the Middle East and the Mediterranean Basin

Created under the auspices of UNESCO according to CERN model

The first international research organization
in a Muslim Country

Hafeez Hoorani, Vienna - 2009

Objectives

- **Promote science and technology in the region**
- **Help to improve mutual understanding and building trust among people from different traditions, religions and races**

- **UNESCO "Science for Peace"**

How to do it ?

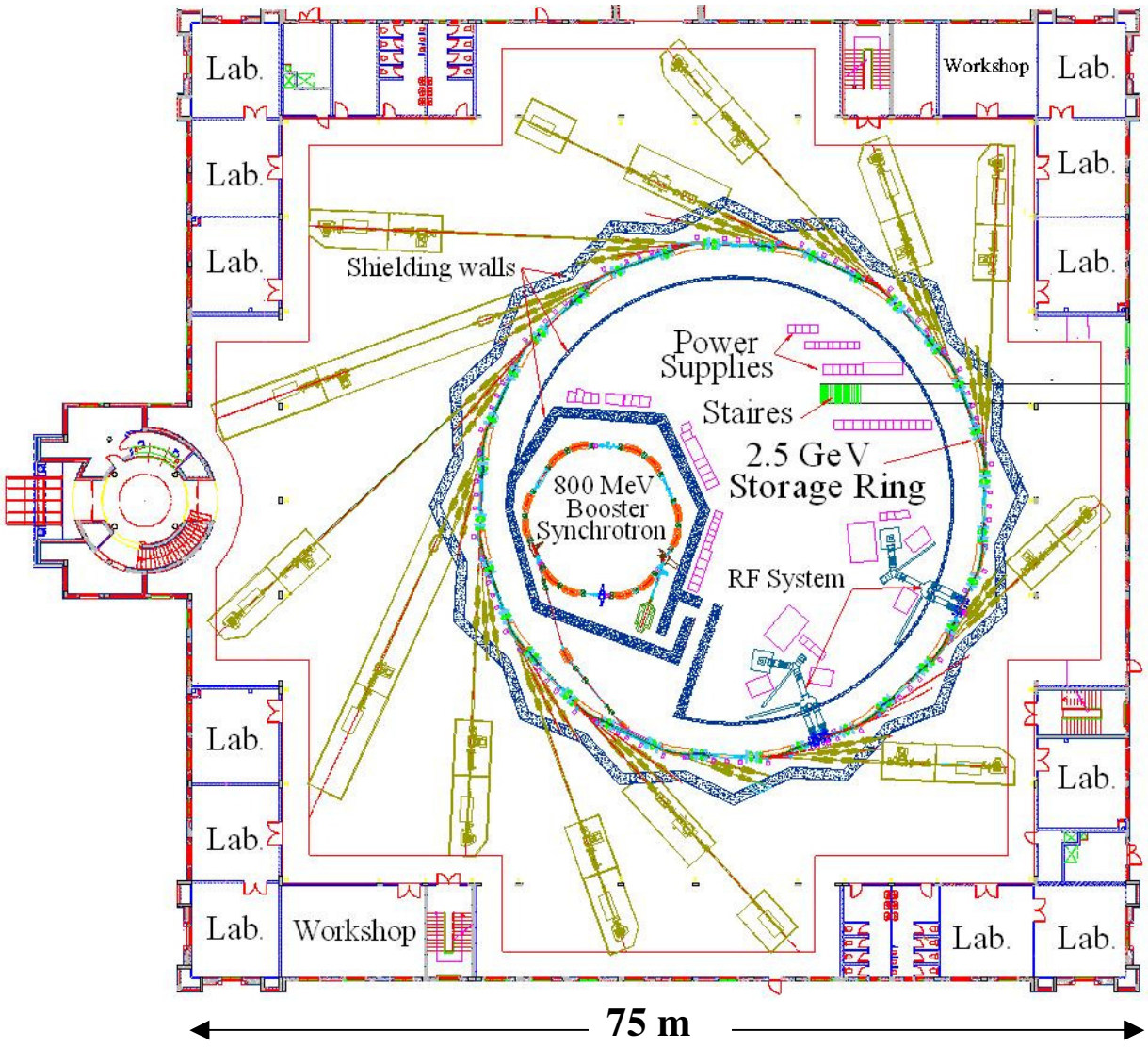
- **Create a centre of excellence for interdisciplinary research with competitive research facilities**
- **Promote international cooperation, main principle: Scientific Excellence**
- **Training of scientists, students and technicians (and even administrators)**
- **Attract scientists from the region working abroad, Reverse Brain Drain**
- **Promote the development of applications and high-tech industry**

What is the SESAME Facility ?

- **Scientifically competitive third generation light source**
- **A synchrotron which produces intense light from the infrared region to X-rays.**
- **Apart from high intensities, SR light has special properties (very short pulses, polarized)**
- **Individual photon beams with varying parameters for specific research domains**

STORAGE RING Main Parameters

Parameter	Unit	Value
Energy	GeV	2.5
Circumference	m	133.2
Maximum Current	mA	400
Bending Dipole field; gradient	T; T/m	1.45545 ; -2.794
Emittance x / z	nm.rad	26 / 0.26
RF frequency ; peak voltage	MHz ; kV	499.564 ; 2.4
Natural bunch length	cm	1.16
Expected Beam Lifetime	h	18



Energy	2.5 GeV
Current	400 mA
Circumference	128.4m
Emittance (horiz)	26.4 nm-rad
Possible IDs	12
ID Length	2.75 m

e^- Beam Size in Straight Sections

σ_x/σ_y	700μm/35μm
Critical Energy	5.9 KeV
e^- Energy Spread	0.1%
Bending Mag. Field	1.425 T

Outlay of SESAME

Parameters: 2.5 GeV ring with 12 possible insertion device beam lines. Beam lines can also come from the 16 bend magnets.

Why a synchrotron radiation source for the region?

❖ **SR sources have became important tools for research in many domains and for interdisciplinary research**

60 sources are in operation worldwide with ~ 30.000 users
including Brazil, China, India, Korea, Taiwan, Thailand
in Japan about a dozen sources, in Germany 4 SR sources

❖ **Cheaper and less complicated than neutron source (research reactors, spallation sources), more versatile than lasers**

❖**Smaller facilities are competitive can do about 90 % of research**

❖ **No source in Middle East !! SESAME will be the first!!**

❖ **But not the last and only one !!**

Large Members of SESAME (Pakistan, Egypt, Turkey, Iran) will learn how to build facility, establish beamlines, train people

Is SESAME really needed in the region?

Abdus Salam dreamed of several centres in the Middle East.

- ***At 1983 Symposium held at Bahrain University on the Future Outlook of the Arabian Gulf :***
  Salam proposed *SR Lab for Saudi Arabia, Bahrain,*
  did not happen

- ***H. Schopper proposed SR Lab for Saudi Arabia about 10 years ago,***
  did not happen

SESAME will change the situation!

A Brief Early History of SESAME

1997: Proposal to use components of BESSY I as basis for new facility in the Middle East

June 1999: F Mayor, DG UNESCO ("Science for Peace"), invited all governments of the region to a meeting at Paris. **Interim Council created** with 12 members and 6 Observers; **H.Schopper elected President**

2000 – Site choice (candidates in Armenia, Egypt, Iran, Jordan, Oman, Palestinian Authority, Turkey)

– 18 scientists (mostly machine physicists & engineers) chosen to be trained at ANKA, Daresbury, Elettra, ESRF, LURE, MAXLAB, SLAC

2002 – Formal endorsement by UNESCO

– Decision that BESSY should be injector to new 2.5 GeV ring

6 January 2003 – Ground breaking by King Abdullah II and DG of UNESCO

15 April 2004 – Statutes ratified: Official Birth of SESAME

3 November 2008 – Building opened by DG of UNESCO and Prince Ghazi Ben Mohammad. C Llewellyn Smith took over as President of Council

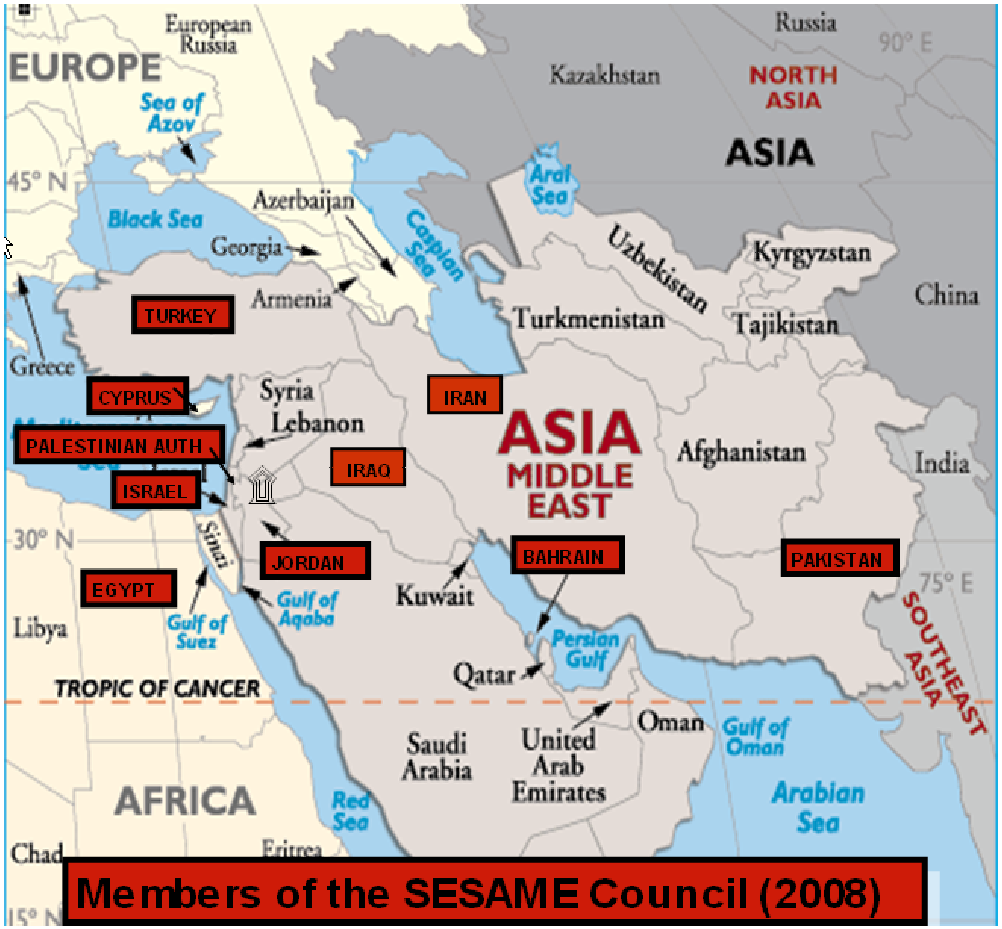
2000: Germany makes gift – components of BESSY I

Condition: orderly dismantling is financed by SESAME and UNESCO
$ 600.000

After clarification of legal problems with the help of UNESCO equipment shipped to Jordan in June 2002

Boat leaving Hamburg harbor on its way to Aqaba in Jordan with BESSY I on board; June 7, 2002

SESAME Members

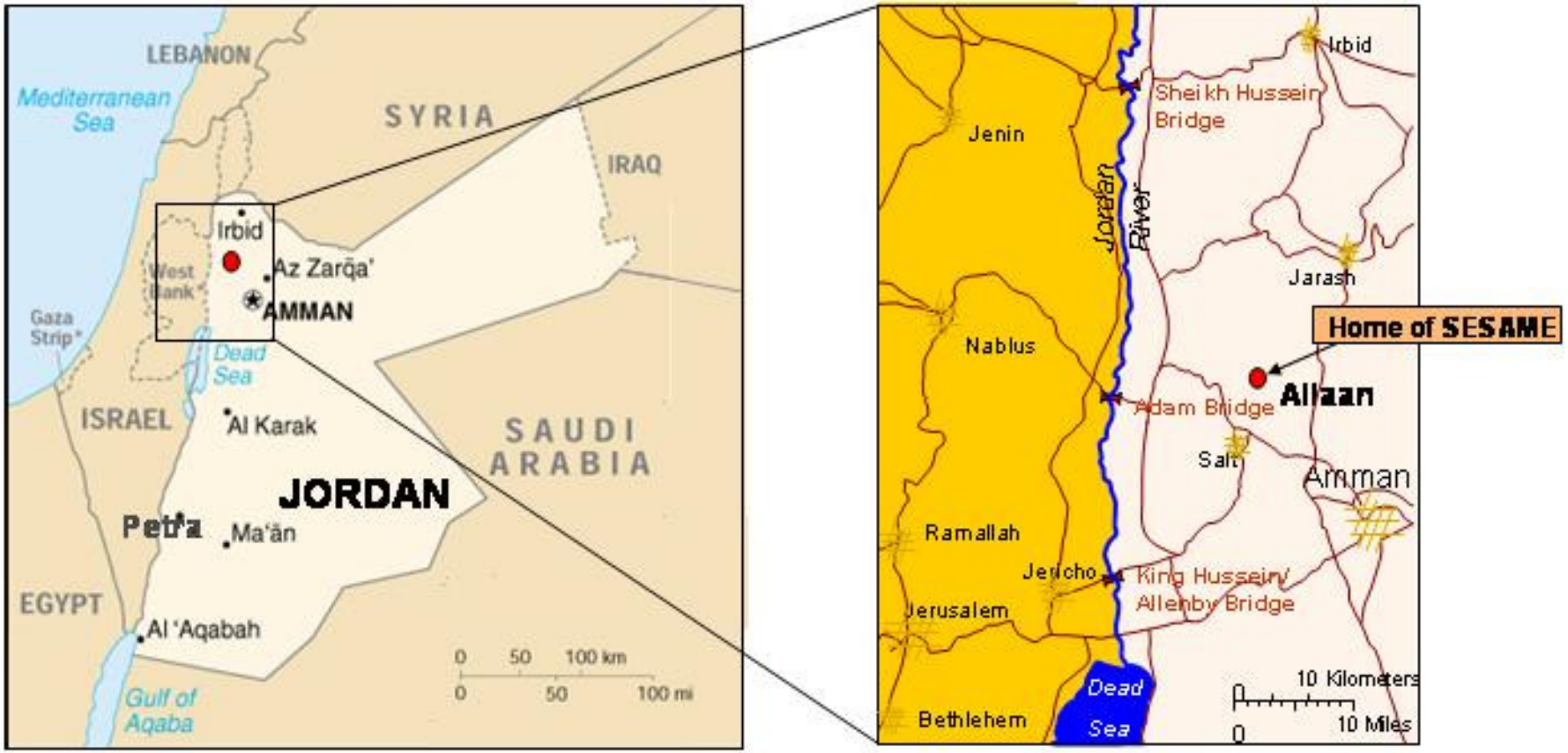


Bahrain Cyprus
Egypt Israel
Iran Jordan
Pakistan Turkey
Palestinian Authority

Pending: Iraq

Observer Countries

France, Greece, Germany, Italy, Japan, Kuwait, Russian Federation, Sweden, UK and USA.



SESAME location in Allaan, Jordan

H.M.King Abdullah II and UNESCO DG Matsuura unveiling marble plate, SESAME site groundbreaking 6th January 2003

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SESAME site before construction


R.Sarraf 28-2-2007

International Advisory Committees

Beamlines Committee:

Chair: Zahid Hussain (USA/Pakistan)

define beamlines, help to set up collaborations, later evaluating proposals

Scientific Committee:

Chair: Zehra Sayers (Turkey)

advice on long term policy, energy and upgrading of machine

Technical Committee:

Chair: Albin F. Wrulich (Germany)

advice on machine design, technical solutions, cost estimates

Training Committee:

Chair: Javad Rahighi (Iran)

help in organizing training programme, selection of candidates

Finance Committee

Chair: Andreas Moleski (Cyprus)

prepares budget, distribution of contributions among Members

Capacity Building

Training one of the essential objectives of SESAME

- **Users Meetings, Schools & Workshops**
  - **SESAME Users Meeting (Annual Event)**
  - **Japan - SESAME Workshop (JSPS)**
  - **CERN Accelerator School - 9 Students 2005, 8 Students 2008**
- **Training of machine experts (supported by IAEA)**
  - **20 fellows, finished in 2004, some became staff**
- **Training of beamline experts - mainly supported by IAEA**
  20 scientists and researchers are trained already more to come
- **Training of potential users through special programs & fellowships:**
  - **NSRRC - SESAME Fellowships (3 Fellowships per year)**
  - **Brazil (3 Fellowships per year)**
  - **DoE - SESAME Program (20 ME Scientists Trained)**
  - **SESAME - Portugal (6 Fellowships per year)**
  - **SESAME - Japan Fellowships .. Under discussion**
  - **APS/EPS/IoP and Canon Foundation Funds**

SESAME Workshops and Schools (2000-2009)

1st Workshop on Structural Molecular Biology (SMB);
University of Athens, 6 - 7 April, 2000;
Workshop/School on Accelerator Science & Technology
Al-Balqa' Applied University Al-Salt, Jordan, 9 - 19 Sept, 2000.
Workshop on Materials Science;
Hacettepe University, Ankara, 21 - 22 Sept, 2000.
2nd Workshop on Structural Molecular Biology (SMB)
University of Cyprus, 6 - 7 December, 2000.
Workshop Bioinformatics & Structural Modeling;
Istanbul, Turkey, 3 - 8 Sept, 2001;
1st JSPS Asian Science Seminar & 1st SESAME Users Meeting,
19 - 28 October, 2002 at Al-Balqa' Applied University, Al Salt, Jordan
2nd SESAME Users' Meeting
29 Nov. - 1 Dec. 2003, Esfahan, Iran.

SESAME Workshops and Schools (2000-2009)

3rd SESAME User Meeting
October 6 - 8, 2004, Antalya, Turkey
4th SESAME User Meeting
December 6 - 8 2005, Dead Sea, Jordan
5th SESAME Users' meeting and workshop
Nov27 - Dec2, 2006, Cairo, Egypt
6th SESAME Users' meeting and workshop
Nov 17 - Nov 19, 2007, Amman, Jordan
7th SESAME Users' meeting and workshop
Nov 21 - Nov 23, 2008, Cairo, Egypt
2nd JSPS - SESAME Workshop
Nov 17 - Nov 23, 2008, Cairo, Egypt
8th SESAME Users' meeting and workshop
Nov 17 - Nov 20, 2009, Amman, Jordan
3rd JSPS - SESAME Workshop
Planned for 2009-10

Summary

- SESAME is a model project in Middle East
- SESAME will help:
  - Capacity Building in the region
  - State-of-the art research in various science disciplines
  - Act as catalyst for several such projects at the national level in the region
  - Generate understanding between various groups
- **SESAME is truly "Science for Peace"**