PRESENT STATUS OF SESAME

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Abstract

SESAME (Synchrotron radiation for Experimental Science and Application for the Middle East), located in the western suburb of Amman, capital of Jordan, is an international institute in the Middle East. The main objective of SESAME is to promote sciences and to create peace in the region. Its main facility is a 2.5-GeV light source. This institute has been formerly established in January, 2003, and the construction of the building has already started. At present, Pakistan, Iran, Turkey, United Arab Emirates, Bahrain, Jordan, Palestinian Authority, Israel and Egypt are members of SESAME. In this paper, the basic design of the light sauce and the present status of the project are given.

INTRODUCTION

SESAME, Synchrotron light for Experimental Science and Applications in the Middle East, is an international research institute located in Allan in Jordan, and has been formally established in January 2003 as an independent international research institute. The main facility of the institute is a 2.5 GeV synchrotron with a 124-m circumference. The site of SASAME is about 30 km west of Amman, Capital of Jordan, and 30 km east of the border between the Palestinian Authority and Jordan. At present (September 2003), the following nine countries are its formal members: Pakistan, Islamic Republic of Iran, The Arab Emirates, Bahrain, Turkey, Jordan, The Palestinian Authority, Israel, and Egypt.

SESAME was established on a model of the European Organization for Nuclear Research (CERN) in Geneva, Switzerland. From the outset, UNESCO has been an active player in establishing SESAME. Now SESAME is an independent entity in its own right, UNESCO plays a depository role for SESAME. Indeed CERN was created after the world war II to unite war-torned Europe through science.

The word SESAME may be interpreted as a 'door opener', namely, 'Open SESAME'. Indeed, SEASAME is expected to open many doors. By becoming world-class laboratory, SESAME will provide facilities for basic research and many applications and thereby promote science and technology in the region, and, in this way, people gain a better understanding of one another, promote tolerance and, ultimately, enhance the chances of peace. It is notable that both Israel and the Palestinian Authority are formal members of SESAME.

For the details of SESAME please refer to the following web site:

http://www.sesame.org.jo

THE SESAME STORY

When Gustaf-Adolf Voss of the German Electron Synchrotron (DESY) attended one conference held in Trino in November, 1997, he met two Jordanian Nuclear Physicists, Mahmoud Kofahi of Al-Balqa' Applied University and Sami Mahmood of Yarmouk University. He asked them about the status of accelerators in the Middle East. These two Jordanians mentioned that unfortunately there were no facilities in the Middle East at that time. Then Voss came up with an idea that to send BESSY I that was close to finish its role as a light source to the Middle East and suggested this idea to them. These two Arab scientists were became interested.

On this idea of Voss an international synchrotron light source in the Middle East was first proposed in 1997 by Herman Winick of the Stanford Linear Accelerator Center (Stanford University, USA) and Voss during a workshop organized by the CERN-based Middle East Scientific Co-operation group headed by Sergio Fubini. Germany had just decided to decommission its facility, BESSY I, since a newer one was being built in Berlin. At the request of Sergio Fubini and Herwig Schopper, the German government agreed to donate the components to SESAME, provided the dismantling was taken care of by the latter.

The plan was brought to the attention of Federico Mayor, then Director-General of UNESCO, who called a meeting at the Organization Headquarters in Paris in July 1999 of delegates from the Middle East and other regions. The outcome of the meeting was the launching of the project and the setting-up of an International Interim Council under the Chairmanship of Herwig Schopper.

Jordan, which has been selected to host the centre, is providing the land as well as funds for the construction of the building.

The JSPS Asian Science Seminar on Synchrotron Radiation Sciences was held in Jordan on October 20-November 2 of 2002 jointly organized by JSPS, KEK, and Al-Balqa' Applied University. It had more than hundred participants including 70 Arab scientists, 10 Japanese lecturers. During the Seminar, the first SESAME users meeting was held on October 26-27, and the drawing-up of the initial beamlines was begun.

The groundbreaking ceremony was held in January 2003 and construction work began the following July. The component parts of BESSY I have been shipped from Germany to Jordan.

In May 2002, the Executive Board of UNESCO unanimously approved the establishment of the centre under the auspices of the Organization and UNESCO becomes the depository of the SESAME Statutes. In

January 2003, the Centre creation was formally sealed following an exchange of correspondence between Koichiro Matsuura, Director-General of UNESCO, and UNESCO Member States.

Immediately after the groundbreaking ceremony in January 2003, the first meeting of the permanent Council, replacing the International Interim Council, took place. At this first meeting, the centre statutes were approved and the President (Herwig Schopper from Germany) and two Vice-Presidents (Khaled Toukan from Jordan and Dincer Ulku from Turkey) of SESAME were elected.

The second Council meeting was held in July 2003 in Istanbul in Turkey, where Khaled Toukan, Minister of Education of Jordan, was elected as acting Director of SESAME with four-year term.

Figure 1 shows the location of SESAME and its member countries.

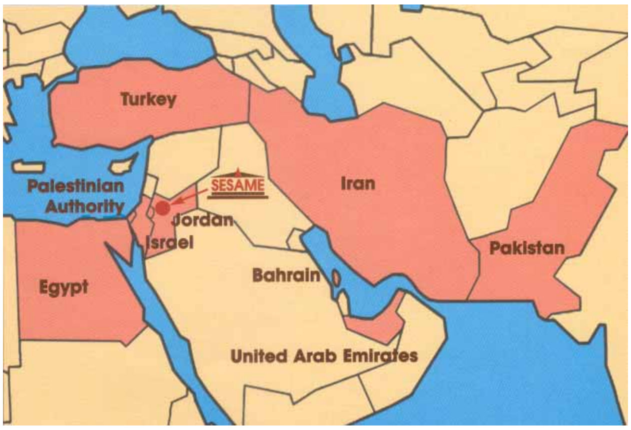

Figure 1: The location of SESAME and its member countries

SESAME SYNCHROTRON LIGHT SOURCE

Although SESAME was triggered by the gift from Germany of the 0.8 GeV BESSY I storage ring and injector system, through discussion among scientists, the parameters of SESAME were optimized and a final design energy of 2.5 GeV and circumference of 124 m were selected. Its performances will be equivalent to the modern synchrotron, the so-called third generation sources which are defined as synchrotrons where the main light sources are undulators and wigglers and light beams are highly collimated. Figure 2 shows a bird-eye views of the building. Figure 3 shows the layout of the accelerators and Table 1 summarises the parameters of synchrotron. .

SESAME is expected to begin operations in 2008 with about six beamlines, and their number being expected to rise to 20 by 2013. Several hundred scientists from the region and other parts of the world are expected to use these beamlines, which will cover disciplines ranging from archaeology to the biological and medical sciences. This will make SESAME a unique multidisciplinary centre in the Middle East.

Figure 2: Bird-eye views of the building

The synchrotron light source is to be housed in a building built specially for the purpose at Al-Balqa' Applied University (Jordan). Financed by Jordan, the building has been designed by civil engineers from Al-Balqa' Applied University. The design builds on the experience of the ANKA facility in Germany, which has also provided guidance. Construction of the SESAME building began in July 2003. In addition to the synchrotron and beamlines, the SESAME building will house support laboratories for visiting scientists.

TRAINING

SESAME will provide essential infrastructure for the scientific and technological development of the Middle East. Experienced scientists will be attracted by the prospect of returning home to their region to pursue their research interests at SESAME and graduate students and young researchers will no longer have to go abroad for advanced training. Once SESAME has been established as a physical entity, a highly trained scientific and technical staff will ensure that both experienced and inexperienced users of the centre are successful in their experiments. This user-facility approach has proved its effectiveness in opening this advanced technology to thousands of users from many disciplines, including biology, chemistry, geology, materials science, medicine and physics, in most synchrotron radiation sources worldwide. As an interdisciplinary centre, SESAME will provide a stimulating environment for international co-operation. The process of training Middle Eastern scientists in the uses of synchrotron radiation and both scientists and engineers in the relevant accelerator technology is well under way. From 1999 to 2002, more than 150 scientists and engineers from the region participated in ten SESAME workshops and schools in the Middle East on applications in biology, materials science and other fields, as well as on accelerator technology. Approximately 30 of these men and women have spent periods of up to two years working at synchrotron radiation facilities in Europe and the USA. The majority of these facilities are situated in countries that are Observers to the SESAME Council. These facilities offer scientists from the Middle East the opportunity to use their own light sources while SESAME is under construction, thereby providing them with first-hand experience and further swelling the ranks of Middle Eastern scientists with experience in using synchrotron radiation sources. European, American and Japanese centres are also contributing valuable assistance and advice in designing, constructing and utilizing SESAME.

Past experience of synchrotron light centres from different parts of the world shows the substantial and practical benefits for the host region: The regions best scientists and technologists are motivated to stay in the region or return if they have emigrated; The members brightest young talent is attracted to scientific higher education and thus contributes to the development of a knowledge-based economy; By stimulating the regional economy, synchrotron centres create jobs well beyond those of the centres' own staff. They create business for local and regional operators in the areas. Frequently, enterprises involved in research and development acquire additional know new synchrotron-based technologies like structural genomics, materials science, etc.

Table 1: The parameters of synchrotron.

Energy (GeV)	2.5
Current (mA)	400
Bending flux density (T)	1.4
Circumference (m)	124
Emittance (nm.rad)	24.6
Length of straight section (m)	2.77
The beam cross section of the long straight section (μm)	730x22
Available straight sections for insertion devices	13

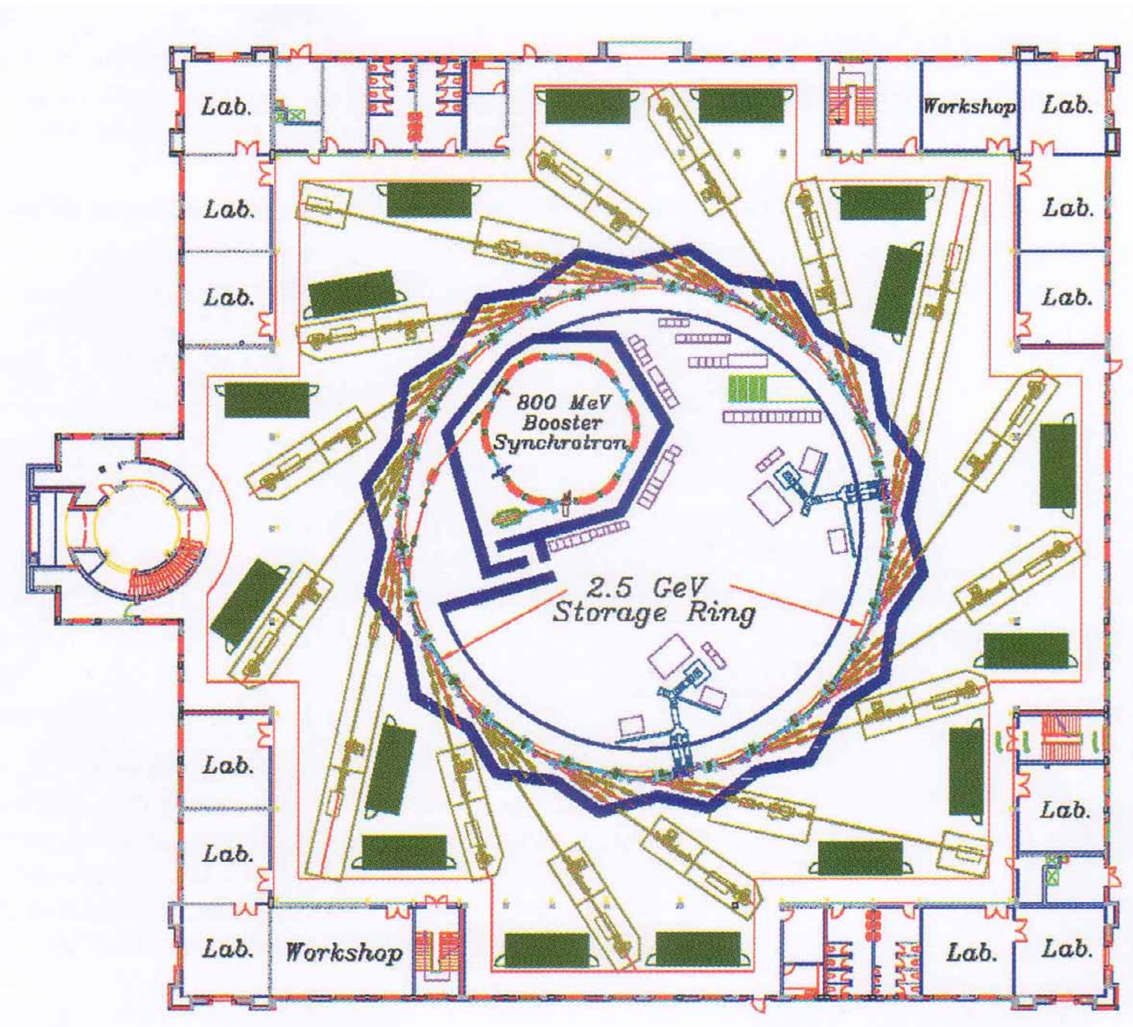

Figure 3: The layout of the accelerators