1. Introduction

Use of synchrotron radiation for fundamental science and applied technologies has experienced an explosive growth over the last twenty years. The growing importance of this new tool in such diverse fields as

- Molecular environmental science
- Medical imaging
- Pharmaceutical R&D
- Micro fabrication
- and others

cannot be overlooked and is beginning to also have an economic impact. About 45 synchrotron radiation sources are in operation worldwide and more are under construction. Although synchrotron radiation sources have become available in several threshold countries including Brazil, China, India, Korea, Thailand and Taiwan, there are still many regions, including the Middle East, where such instruments are not available.

It is anticipated that a synchrotron light source would have a major impact on the development of science and technology in the Middle East region, with particular relevance to health and environmental issues, as well as benefits to industrial development, student training and the general economy of the region. As a cooperative venture by several countries in the Middle East region it also serves to promote understanding and peace in the region.

The decision to build the 3rd generation light source BESSY II in Berlin, was already made in 1993. This machine has been commissioned in 1998 and routine operation has started in January 1999. Because of limited funds, the German Ministry of Education and Research (BMBF[1]) and the Senate of Berlin, decided in 1997 to shut down BESSY I at the end of 1999 in order to concentrate the available funds on the operation of BESSY II.

Since the fall of 1997 extensive discussions (initiated by Prof. Voss and Prof. Winick) have taken place to see whether BESSY I in an upgraded form could be brought to a suitable new place in the Middle East to serve as a seed for a new research centre. These discussions included scientists and administrators in many Arab countries and Israel, German government officials and other scientists from the US, Europe and Japan. Some of the discussions took place at the UNESCO Headquarters (Paris) and a meeting in Uppsala / Sweden in April 1998 of the CERN-based Middle East Scientific Cooperation (MESC-group).

A meeting at UNESCO in Paris in June 1999 led to the formation of Interim Council and four Committees (Scientific, Technical, Training and Financial) to follow up this idea and prepare the next steps. During the first meeting of the Scientific and Technical Committee in August 1999 in Berlin, the scientific case and the technical concept of the project have been reviewed in detail, and the name SESAME has been adopted for the project:

SESAME

Synchrotron Light for **E**xperimental **S**cience and **A**pplications in the **M**iddle **E**ast

The proposal (Green Book) for SESAME has been issued in October 1999. Assuming a positive decision about the relocation of BESSY I early in the year 2000 and assuming the availability of the necessary financial support, SESAME could start its experimental program in its new location in 2003.

[1] - Bundesministerium für Bildung und Forschung

The idea is not only to move BESSY I to the Middle East Region but also to upgrade it in order to get a state of the art machine. The layout of this proposal (BESSY IA) is given in the October 1999 "Green Book". This modification was dictated by the requirement of the users to get hard X-rays. In the Green Book, BESSY I is changed to six-fold symmetry by changing the optic from TBA- to DBA- structure. Furthermore the circumference was enlarged from 64 to 100 meters. With the modification of the bending magnets the energy was increased to 1 GeV. This decreases the emittance by a factor of 5 and leads to an excellent beam cross section.

To reach hard X-rays the intention was to introduce 2 super conducting wigglers in so-called mini beta sections. The usage of these wigglers has some disadvantages: 1) They are costly 2) need a special knowledge for running and 3) have an influence on beam behavior. Furthermore the emitttance will be spoilt by a factor 5.

In the meanwhile Prof. Winick organized some workshops to get better understanding of the scientific case at SESAME. A result of these workshops was, that most users require hard X-rays and the synchrotron light source SESAME should have more beam lines in this spectral range. The simplest way of doing this is by getting hard X-rays from the bending magnets. This is possible by increasing the energy to 2 GeV. The Interim Council of SESAME made in December 2001 the decision of upgrading SESAME to 2 GeV.

The site of SESAME will be Allan, Jordan, which is 25 km northwest of Amman. Jordan will provide the building and the decision was made to copy more or less that one of the synchrotron light source ANKA (60m*60m, covered with a crane), which houses a 2.5 GeV storage ring with a circumference of 110 meter. With a required 30 meters length of the beam lines the largest circumference of a machine in this "ANKA-building" is 124 meter. With this boundary a new concept for the synchrotron light source SESAME has been worked out during the last month. It is an 8-fold symmetry machine with energy of 2 GeV. By using gradient bending magnets it is possible to have 8 long straight sections and 3 short ones for the installation of insertion devices and furthermore a reduction of the natural emittance down to 18 nmrad. This is really a state of the art synchrotron light source.

The erection of the machine can be performed in different steps. First, it should use as much as possible from the existing storage ring BESSY I, for example all quadrupoles and sextupoles in order to reduce the erection costs but provide already photons beams with a good quality for the first synchrotron radiation experiments. The 2nd step could be the changes of these elements by new ones with a shorter length to increase the length of the long straight sections and the brilliance of the radiation. The 3rd step would be the introduction of mini beta sections to increase the brilliance of the synchrotron radiation from the insertion devices even more. The best way would be to start with the 2nd step, but this is a question of the available money.

The budget for the upgrading to the 2 GeV version are in the same order of magnitude as for the "Green Book" design. The only thing that has to be done is the shifting of money between the different components. For example in the "Green Book" design it is proposed to use a new pre-accelerator. Now the intention is to continue to use the 22 MeV Microtron and to shift the money to the new bending magnets. For the upgrading of the RF-system donations are expected from DESY, ELETTRA and SPEAR.

To establish the staff for the erection as well as the running of the machine, a training program has been started. Within this training program up to 16 trainees have worked at the different European Accelerator Laboratories: DESY, ESRF, ANKA, SLS, LURE, MAX-LAB, ELETTRA and Daresbury. The description of the new layout of the machine in the following "first draft version" of the conceptional design report has been made by these trainees with the help of the colleagues at the host laboratories.

This paper of the "first draft version" of the conceptional design report gives only the first ideas how the accelerator and the building will look like. In the future a more detailed study has to be performed.