



International Atomic Energy Agency

**“Training Course on Synchrotron-based Techniques and Complementary Techniques”
under the SESAME School on Cultural Heritage**

PROSPECTUS

<u>Project Number & Title:</u>	INT/0/092 “Building Human Capacity for the Construction, Operation and Use of Synchrotron-Light for Experimental Science and Applications for the Middle East”
<u>Place:</u>	SESAME, Allan, Jordan
<u>Dates:</u>	11-15 March 2018
<u>Deadline for Nominations:</u>	15 January 2018
<u>Organizers:</u>	SESAME and the Government of Jordan in cooperation with the International Atomic Energy Agency (IAEA)
<u>Language</u>	The Training Course will be conducted in English (no translation will be provided).
<u>Background:</u>	<p>SESAME is coming soon into full operation with its two first phase beamlines, the beamline for X-ray Absorption Fine Structure (XAFS) and X-ray Fluorescence (XRF) spectroscopy studies and the InfraRed beamline (IR). Both beamlines are developed and optimized for use in a broad range of emerging applications with importance in various scientific fields, for example in the study of advanced and functional materials, environmental pollution, in biology and biomedicine related studies, but also in the archaeological and conservation research. In the last two scientific fields, in particular, the BASEMA and EMIRA beamlines can be utilized optimally and in a synergistic manner to offer a comprehensive and to a great extent a non-destructive characterization of archaeological and historical remains, including: elemental analysis and chemical speciation of inorganic elements down to ultra-trace levels and molecular organic compounds identification.</p> <p>The last ten (10) years, the use of Synchrotron Radiation (SR) techniques has evolved very rapidly in the field of cultural heritage by supporting advanced characterization of archaeological/historical remains and artworks (raw materials, manufacture technology, etc.), the understanding of corrosion and deterioration processes and helping to evaluate modern conservation/restoration treatments. In parallel, the intrinsic complex nature of Cultural Heritage remains/objects has fostered instrumentation developments at synchrotrons and the creation of particular working environments for samples handling and data processing bringing together</p>

expertise from different sciences.

On the other hand, SESAME Members have all a remarkably rich cultural patrimony and it is a connecting platform of dialogue and communication of different civilizations, from the antiquity until present time. The future preservation and enhanced demonstration of national cultural property, apart from consisting of a significant economical income through tourism, meets special attention and priority actions by all SESAME Members as an important aspect of their history and testimony of past regional/interregional cross-links, exchanges and peaceful coexistence.

Cultural science using synchrotron light is highly appreciated at most synchrotrons worldwide, not only by boosting instrumental, state-of-the-art developments but also by supporting and motivating the creation of particular culture for project development involving the close cooperation of natural scientists, archaeologists, art historians and conservation scientists. It fits perfectly with the type of applications that the two SESAME beamlines BASEMA and EMIRA, expected to be fully operational soon, are best suited for, individually, but also by combining their applicable techniques for a more integrated characterization of materials

Therefore, a training course using synchrotron radiation under the SESAME School on Cultural Heritage encompasses various benefits and may serve different purposes to support the establishment of a vibrant, end-users community that will be able to submit competitive beamtime research proposals in the near future.

The training course could also show how synchrotron-based techniques are complementary to other radiation techniques such as ion beam analytical and neutron-based methods.

Purpose:

The training course as part of the SESAME School for Cultural Heritage is aimed to help build and expand a SESAME based end-users community through various applications of synchrotron and related techniques.

Scope and Nature:

- a) Introductory topics for the core cluster of SR techniques which are used mostly in the field of Cultural Heritage, namely Fourier Transform infrared spectromicroscopy (FTIR), X-ray Fluorescence (XRF), X-ray Diffraction (XRD), X-ray absorption Near Edge spectroscopy (XANES), Extended X-ray Absorption Fine Structure (EXAFS) and (Phase contrast) X-ray microcomputed-Tomography (μ CT).
- b) Demonstration activities with the operation of the facility and in particular with the installed instrumentation at the two particular beamlines will be provided
- c) Hands on practical activities to allow the participants to develop and improve their skills and competences in the analysis and interpretation of the type of SR data that will be generated by the two beamlines operation (XAFS/XRF/FTIR). For example, the laboratory infrared microscope can be utilized to produce reference data for practical

exercises, whereas XRF data could be also generated and processed (by PyMca) if a portable spectrometer is brought on the site. XAFS data analysis can be also exercised using reference data and widely adopted software packages.

- d) Discussion on the steps and requirements to competently to draft and submit a successful beamtime proposal.
- e) Technical presentations and tutorials by natural scientist experts will be accompanied by presentations from experts in the fields of archaeology/conservation science who as end-users have employed SR techniques.

Participation:

The training course under the SESAME School for Cultural Heritage is open for a maximum of 3 participants from the SESAME members.

**Participants’
Qualifications:**

The participants should have a degree in natural sciences (physics, chemistry, biology, archaeology and related fields with higher Diploma (MSc or PhD) and proven research experience and work in the utilization of scientific methods in the field of Cultural Heritage.

**Nomination
Procedure:**

Nominations should be submitted through the IAEA's InTouch+ platform (<https://intouchplus.iaea.org/>), **with reference to Event Number EVT1704992**. Should this not be possible, applicants may download the Nomination Form for the course from the [IAEA’s webpage](#). Completed forms must be endorsed by the relevant government authority and may be sent to the IAEA by email.

Candidates wishing to attend this training course should access the communication platform InTouch+ (<https://intouchplus.iaea.org/>), with reference to **EVT1704992**, where they can register, complete and update their professional profile online, and also track their participation in the Technical Cooperation Programme.

Please be advised that late nominations or replacements of participants cannot be accepted after the closing date for nominations, **15 January 2018**. Nominations received after that date or applications which have not been routed through the NLO cannot be considered.

Please do not apply in parallel using the MS Word Nomination Form. Use the MS Word Nomination Form only if your Internet connection does not permit to apply through InTouch+ and the National Liaison Officer/Assistant/National Coordinator of your country cannot submit the application in your name.

**Security in the
Field:**

It is recommended that training course participants complete the courses *Basic Security in the Field: Safety, Health and Welfare (BSITF)* and *Advanced Security in the Field (ASITF)*, prior to travelling to locations where UN security phases are in effect. The aim of these courses is to educate participants on how best to avoid or minimize potential dangers and threats, and to show what individuals can do if they find themselves in insecure situations.

The courses are available on the following UN websites by using Microsoft Internet Explorer:

- BSITF: <https://training.dss.un.org/course/detail/19928>
- ASITF: <https://training.dss.un.org/course/detail/19921>

If you have difficulty using the websites, a CD-ROM can be obtained from your IAEA National Liaison Officer, or from IAEA.

Once the candidate has completed the courses and passed the accompanying exams, certificates will be generated automatically and must be printed for submission to the IAEA (either as an e-mail attachment or by fax). Copies of the certificates should be kept by the candidate for his/her records, as they are valid for a period of three years.

**Administrative and
Financial
Arrangements:**

Nominating Governments will be informed in due course of the names of the candidates who have been selected and will, at that time, be given full details of the procedures to be followed with regard to administrative and financial matters.

Selected participants from countries eligible to receive technical assistance will be provided with a round trip economy class air ticket from their home countries to Amman, Jordan, and a Daily Subsistence Allowance (DSA) at the prevailing UN Rate. Shipment of accumulated meeting materials to the participants' home countries is not the responsibility of the IAEA.

The organizers of the training course do not accept liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the training course, and it is clearly understood that each Government, in nominating participants, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.