VACUUM SYSTEM OF SESAME STORAGE RING

M. Al-Najdawi, E. Huttel, F. Makahleh, M. Shehab, H. Al-Mohammad

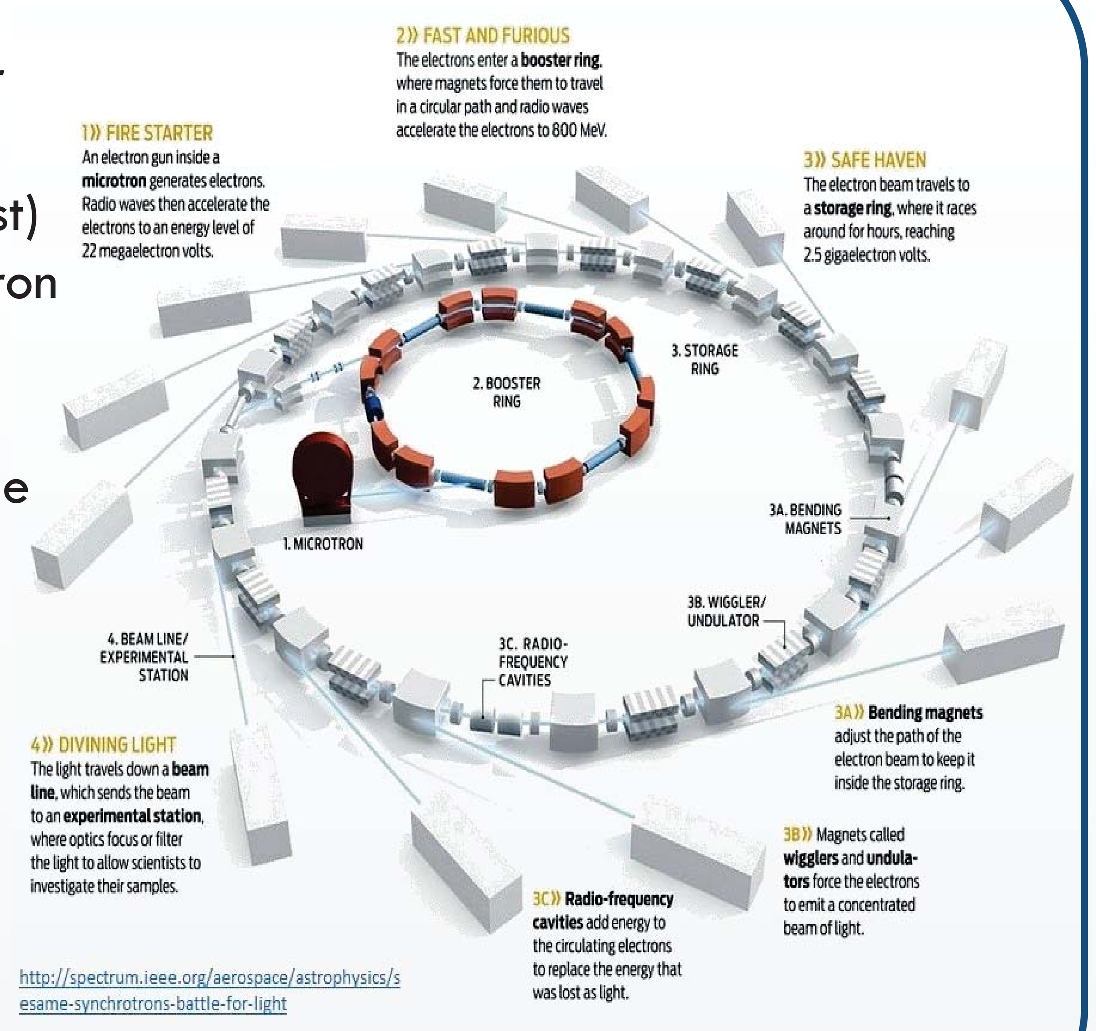
SESAME Light Source, P.O. Box 7, Allan 19252, Jordan. mohammad.najdawi@sesame.orgjo

MEDSI 2016
MECHANICAL ENGINEERING DESIGN OF SYNCHROTRON RADIATION EQUIPMENT AND INSTRUMENTATION

Introduction

SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) is a third-generation synchrotron light source under construction near Amman (Jordan).

The storage ring has 16 Dipole arc chambers 8 short and 8 long straight chambers.

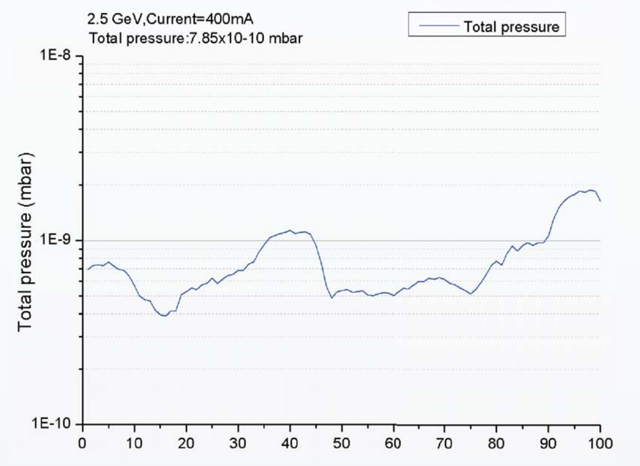


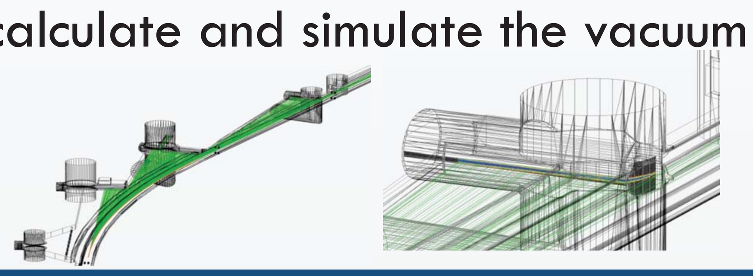
Vacuum chamber design

The SLS approach have been adopted for SESAME vacuum chamber design, SESAME will be a full antechamber machine where synchrotron radiation will pass from the electron beam chamber through a slot to the antechamber towards the lumped absorbers located by the end of each antechamber section where large lumped pump is situated.

Pressure profile calculation

To simulate and calculate the vacuum pressure profile in the storage ring, we have used a coupled simulation using SynRad+ to simulate the beam and Molflow to calculate and simulate the vacuum pressure profile





Pressure profile for one sector

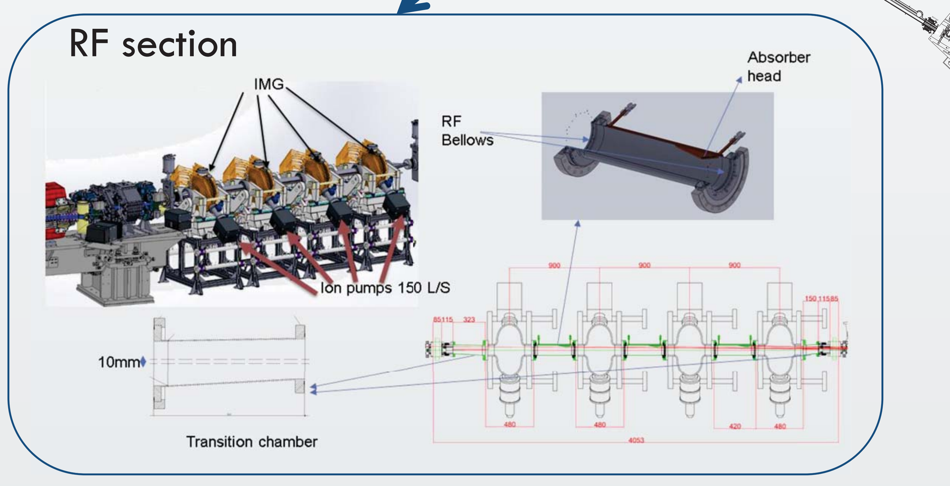
Vacuum layout

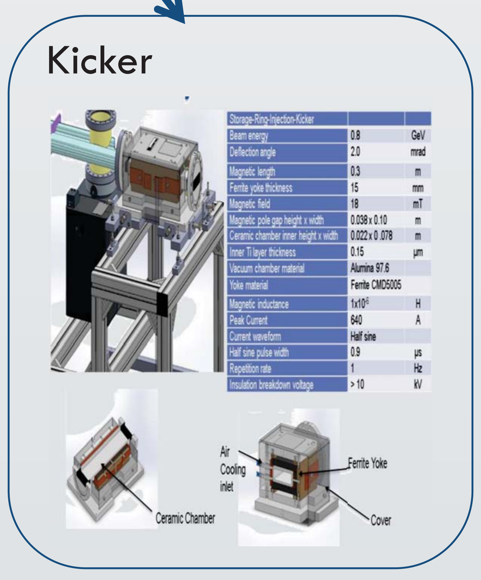
The storage ring divided into 16 cells, each cell contains a dipole arc chamber and a straight chamber (long or short) closed by UHV RF shielded gate valve. There are two types of the vacuum cells, an arc chamber with long straight with a total length of 9.35m and an arc chamber with short straight with a total length of 7.3 m .A lumped absorbers will be used to absorb the unwanted synchrotron radiation (SR), there are four Types of the absorbers based on the location they will be installed. Several sputter ion pumps (SIP) will be installed on the storage ring with an overall nominal pumping speed of 20500 l/s, also, a NEG pumps will be installed near the absorber with the highest SR absorbed (higher outgassing).

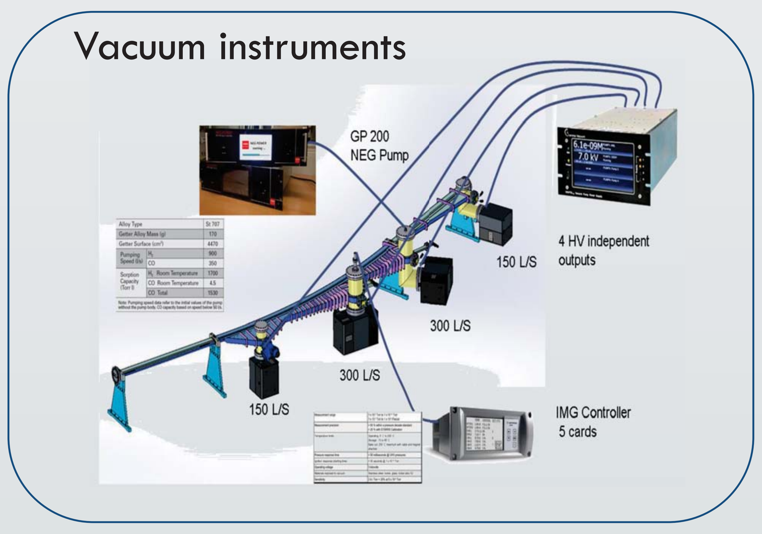
Ion pumps	105 Pumps
Dipole chamber	2 X 300L/S
	2 X 150L/S
Long Straight	3 X 150L/S
Short straight	2 X150L/S
RF Section	4 x 150L/S
NEG pumps	16
IMG	27

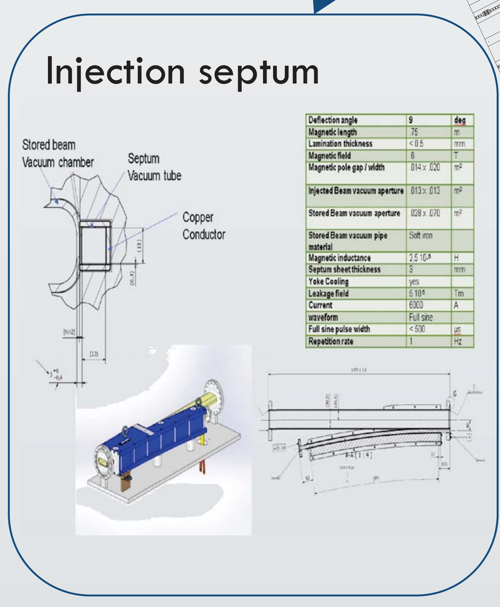
Special sections

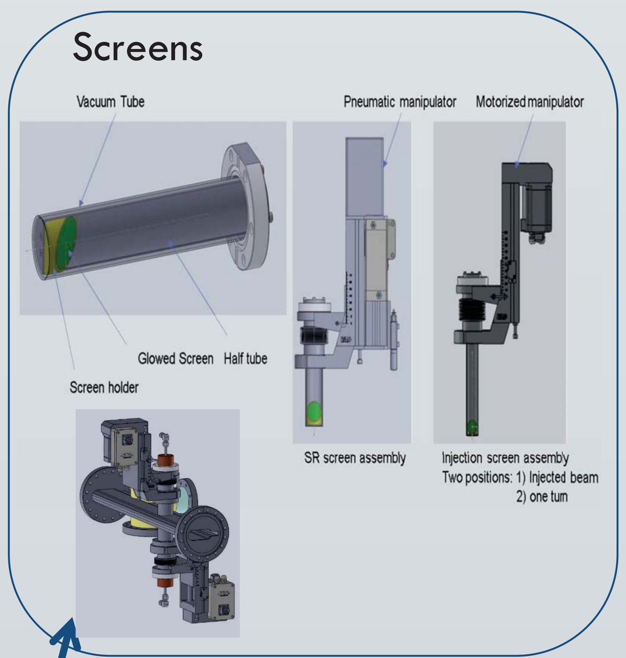
The injection section consists of the injection septum; which has an internal thin walled stainless steel pipe and a stored beam pipe made of mild steel. There will be a horizontal Florissant screen with a motorized linear manipulator to monitor the injected and stored beam, a Bunch by bunch feedback kicker and a vertical scraper also installed in the same section. The second special section is the RF section. Four cavities (Elettra cavity design) will be installed in this section with a downstream and up stream transition parts to have a smooth transition from the key shape arc chamber to the cavity circular shape tube. Between the cavities there will be a transition centre absorbers with RF shielded below at both ends.

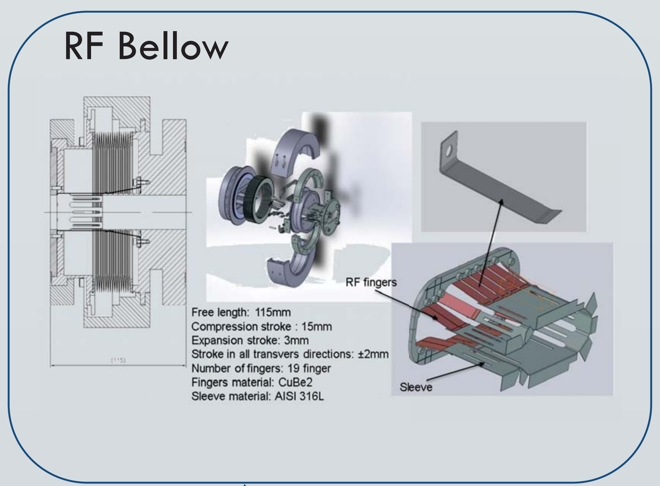












RF Bellow

The RF bellow design is similar to SLS and ALBA design with some modifications, the bellow has a compact design with a free length of 115 mm, the bellow will have a sleeve made of 316L stainless steel sheet and 19 fingers made of beryllium copper sheets (0.4 mm thinness). The bellow will have a cover made of aluminium; the benefit of the cover is to limit the compression and expansion of the bellow, 15mm compression, 3mm expansion and ±2 mm in all transvers directions, also to protect the bellow body from any damage.

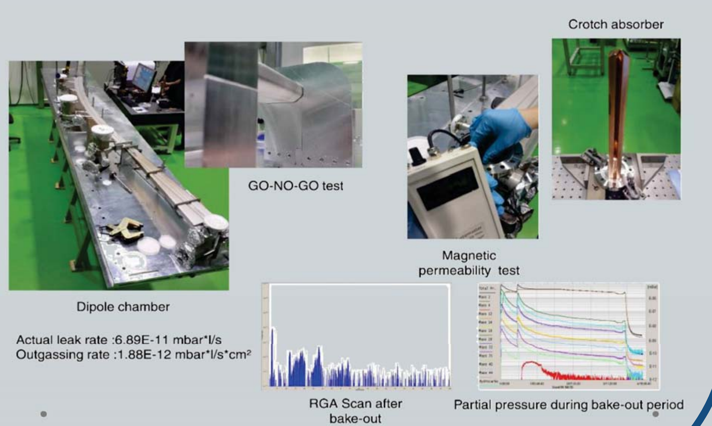
Screens and V. Scraper

Deferent screens will be installed along the storage ring, the screen design is in air The screen driven by either a motorized manipulator or a pneumatic one. A vertical scraper will be installed in the injection section to define the outer edges of the beam

Factory acceptance test

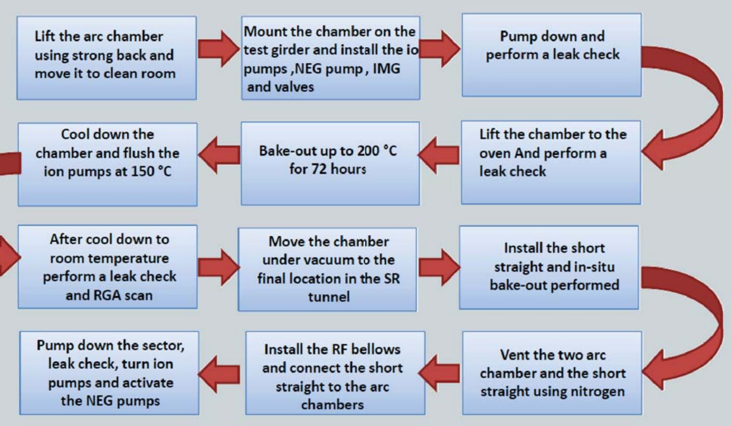
Tests has been done for all chambers

- Dimensional check
- Go and no go check
- Magnetic permeability test
- RGA and Vacuum leak check
- Final outgassing rate
- Absorbers hydraulic test



Chambers bake-out and installation

Chambers installation started in February 2016 and finished in September 2016



Acknowledgement

Special thanks for SESAME installation team, specially the vacuum team for all the effort and hard work they give during the installation of the vacuum system.