

## RESEARCH PROGRAMS AND PLANS AT THE SOREQ APPLIED RESEARCH ACCELERATOR FACILITY – SARAF

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The Soreq Applied Research Accelerator Facility (SARAF) is under construction in the Soreq Nuclear Research Center at Yavne, Israel. When completed at the beginning of the next decade, SARAF will be a user facility based on a 40 MeV, 5 mA CW proton/deuteron superconducting linear accelerator. Phase I of SARAF (4 MeV, 2mA CW protons, 5 MeV 1mA pulsed deuterons) is already in operation. By use of a novel liquid lithium target (LiLiT), we generated up to  $5 \times 10^{10}$  epithermal neutrons/sec, mainly for nuclear astrophysics research of slow neutron capture processes (s-process).

We present an overview of SARAF, including a survey of existing research programs at Phase I and the research potential at the completed facility (Phase II). The main ongoing program at Phase I is measurement of 30 keV neutron Maxwellian Averaged Cross Sections (MACS), important for the astrophysical s-process. The world leading Maxwellian epithermal neutron yield at SARAF enables improved precision of known MACSs, and new measurements of low-abundance and radioactive isotopes. Research plans for Phase II span several disciplines: Precision studies of beyond-Standard-Model effects by trapping light exotic isotopes, such as  ${}^6\text{He}$ ,  ${}^8\text{Li}$  and rare Ne isotopes, in unprecedented amounts (including meaningful studies already at Phase I); extended nuclear astrophysics research with higher energy neutrons, including generation and studies of exotic neutron-rich isotopes relevant to the rapid (r-) process; High energy neutrons cross sections for basic nuclear physics and material science research, including neutron induced radiation damage; neutron based imaging and therapy; and novel radiopharmaceuticals development and production.