

Nuclear Astrophysics Underground: Status & Future

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Even 60 years after the groundbreaking publication by Burbidge, Burbidge, Fowler, and Hoyle, Nuclear Astrophysics is still a thriving research field at the interface of nuclear physics, astrophysics, and particle physics. An important topic is associated with the evolution of stars and its impact on the production of heavy elements. The study of the key reactions has been a major goal by the community, in Europe, the US and also in China. However, the cosmic ray induced background has been prohibitive for advancing these measurements into the stellar energy range and reaction rates rely on theoretical extrapolations.

Accelerator laboratories, located deep underground offer unique conditions for measuring these reactions at low energies as demonstrated by the success of the LUNA facility at Gran Sasso, Italy. Over the past years the CASPAR laboratory has been commissioned at the Sanford Underground Research Facility (Lead, South Dakota) to address the further need for such facilities. CASPAR operates a 1MV, fully refurbished Van de Graaff accelerator that can provide beam intensities of more than 100 micro-Ampere. Furthermore, the LUNA-MV facility as well as the JUNA project in China's Jinping Underground Laboratory will be operational in the near future. Successful implementation of a science program at these facilities result in significant progress in the field. The current status of the underground accelerator facilities for Nuclear Astrophysics will be reviewed.

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