

## Preface

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# Preface

The Laboratory of Nuclear Science (LNS), belonging to the Graduate School of Science, Tohoku University, started in 1966. Since then, it has served as a user's facility available to the scientific community in University, national and international. The basic accelerator of the LNS is a 300-MeV electron linear accelerator (LINAC), which has been working since 1967. In 1995, the construction of a new accelerator which is called 1.2 GeV Stretcher-Booster ring (STB ring) started.

The STB ring was originally designed to be operated under three different modes : (1) the pulse beam stretcher mode, in which a pulsed beam from the LINAC is accepted and a continuous beam is extracted from the STB ring, (2) the booster mode, in which an electron beam from the LINAC is accelerated up to 1.2 GeV, and (3) the storage mode, in which the beam at 1.2 GeV can circulate in the STB ring. The mode (1) is used for low energy ( $\sim 200$  MeV) experiments performed at external target stations using the existing experimental equipment such as the large dipole magnetic spectrometer. The mode (2) together with a fast extraction of the beam will be solely used for an injection of a planned 1.8 GeV synchrotron radiation ring which is a future project but not funded, yet. The mode (3) is used for GeV energy nuclear physics experiments performed at an internal target station directly using the circulating beam or at an external target station using GeV tagged photons produced in the ring.

The construction of the STB ring was completed in 1997, and the beam commissioning started. The low energy continuous beam was then available for experiments in 1998. Subsequently the GeV electron beam became available in 1999. Thus, now, the LNS provides continuous electron beams from 0.2 to 1.2 GeV, in addition to the pulsed beams up to 0.25 GeV.

During a period of the construction, no electron beams were available at the LNS except for those with energies below 60 MeV. Some of the nuclear science research have been actively carried out using outside facilities. At the LNS, performed were experiments with various radioactive isotopes produced by low-energy pulsed electron beams from the LINAC. In addition, experiments on low-energy fusion reactions with light nuclei have started by using a low-energy high-current beam generator installed in 1995.

Taking this opportunity of the start of GeV energy experiments, we have decided to modify the quality of this issue 'Research Report of Laboratory of Nuclear Science'. Firstly, the size is changed as you see that new size is the A4 standard. Secondly, in addition to rather complete research reports, short reports which may show the progress of each research annually are encouraged to appear. Thirdly, reports on research activities performed by the LNS staff members but using outside facilities will be also included, in addition to those performed at the LNS by the outside users. Furthermore, writing in English will be more emphasized, although some of the reports were written in English, already, so far.

This issue reports the research activities of the LNS in various fields performed in a fiscal year of 1999 (from April, 1999 to March, 2000), but is the first one after the modification mentioned above. Thus, forms of various reports might not be set to rights. However, we believe the modification contributes to fast exchange of research information, not only domestically but also internationally. We

also believe, the LNS will be successful in promoting productive activities over a variety of nuclear science research fields using electron beams with energies from a few tens of MeV to GeV, high-current keV ion beams and various radioactive isotopes.

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