

L. Corradi

INFN, Laboratori Nazionali di Legnaro

During 2000 the LNL XTU-Tandem accelerator delivered heavy ion beams in the three experimental halls for a total amount of $\simeq 5000$ hours (208 days). 45 days, corresponding to 22 % of the total, were used to inject beams into the ALPI post-accelerator.

During February/March three beam-times using ALPI with $^{32,36}\text{S}$, ^{62}Ni and ^{48}Ca beams with average currents in the range of 2-4 pA could be successfully completed. Unfortunately, in early spring a problem occurred in the liquid He transport system of the ALPI cryogenic set-up, forcing the machine group to stop ALPI beams. The post-accelerator restarted correctly in November and three more beam-times could be performed. Particularly successful was the acceleration of a ^{80}Se beam, which was delivered at $E_{lab}=480$ MeV with an average current of $\simeq 1$ pA. The Tandem accelerator worked properly all over the year, delivering heavy-ion beams at terminal voltages up to $\simeq 15$ MV.

A very relevant amount of work for changing/mounting new set up's has been done in the three experimental halls. In the 1st hall, the large scattering chamber and the Bari neutron-ball, both installed in the $+30^0$ beam-line, have been removed. Also, the SERPE apparatus for γ -particle coincidence studies, after an experiment done with ALPI in early March, has been first removed from the $+20^0$ position and later reinstalled in the $+10^0$. The set-up for condensed matter studies has been also moved from the $+10^0$ to the $+30^0$ beam-line, after an upgrading of the beam diagnostic system.

This change has been done in order to create the appropriate space for the installation of the new magnetic spectrometer for heavy-ions PRISMA. The set-up, which is presently in an advanced status of construction, will be used to perform measurements of multinucleon transfer and sub-barrier fusion reactions at Coulomb barrier energies with unprecedented solid angle ($\simeq 80$ msr). This will also allow to perform γ -particle coincidences in coupled operation with a suitable Ge-detector array.

The set-up for applied physics placed in the $+70^0$ position continued operation with various heavy-ion beams and covered a relevant fraction of the total available machine time. The set-up for radiobiological studies ($+60^0$) has been also upgraded and beam-time was allotted for it.

In the 2nd experimental hall, the four existing set-up's, namely GASP, RMS, PISOLO, $8\pi\text{LP}$, continued operation in normal conditions. As usual, the γ -array GASP (together with the ISIS apparatus for charged particle detection) covered the largest fraction of total beam-time. A new set-up for the production and transport of francium (and other alkalines) ions into a magneto-optical

trap is under construction on the beam-line -60^0 . The trap will be placed inside a shielded area which serves also as a laboratory for laser spectroscopy.

In the 3rd experimental hall, the Bari neutron-ball has been remounted at the ex-Euroball target position and a first successful beam-time with ^{80}Se delivered by ALPI has been already done in December. The two other installed set-up's, the HECTOR BaF₂ detector array and the GARFIELD apparatus for charged particle detection, continued data taking.

The total number of experiments completed during 2000 was 44 ; of these, 15 had foreign users as spokespersons with participants coming from $\simeq 30$ institutions from outside Italy.

Beams were accelerated to the different target points with a beam-time percentage listed below.

Set-up	Detector	Hall	% of beam-time
GASP	γ -array	II	38
RMS+GASP		II	3
PISOLO	TOF spectr.	II	11
$8\pi\text{LP}$	4π det.	II	4
RMS	mass spectr.	II	3
HECTOR	BaF ₂ array	III	4
GARFIELD	4π det.	III	6
N-Bari	neutron-array	III	4
SERPE	γ -p array	I	4
Int. Physics	$+30^0, +60^0, +70^0$	I	18
others	$+40^0, +50^0$	I	2

The LNL Program Advisory Committee met twice during 2000 in order to evaluate the experimental proposals presented for the periods March-July 2000 and September 2000-March 2001. For the first (second) meeting, held in February (July), a total of 22 (24) proposals were submitted for experiments at the Tandem-ALPI accelerator, 3 (5) of which concerned applied physics and were evaluated by the User Selection Panel (USP). The total beam-time request for the 1st and 2nd semester was 119 (147) days, the number of approved proposals by the PAC was 16 (14) and the number of assigned days was 72 (86) respectively. The total number of days allotted for interdisciplinary physics was 15 for both the 1st and 2nd semester.