TANDEM-ALPI

NEWSLETTER

June 1993, Issue No 5

1. Overview.

The Tandem operation during the first part of 1993 was well below the normal standard. Several unscheduled tank openings were necessary because of severe problems with the terminal power supplies and with the Laddertron links. The material used for machining the links was recently changed after the encouraging results reported from other tandem labs which experienced a relative improvement in the mechanical as well as in the electrical properties of new made links. Sparks at terminal voltage exceeding 15 MV in the XTU Tandem revealed to kill the new links with high probability. Therefore the Accelerator Division decided in April of running the Tandem at maximum terminal voltage of 14.6 MV to retain safe operation until the July brake when a scheduled maintenance is suppose to restore the normal performance of XTU.

Nevertheless the experimental program was continued. Out of 18 PAC approved experiments for this period, 9 have already completed successfully the data taking, as listed in Table I. 4 experiments are supposed to be completed before the July brake. 4 experiments were slide to the next schedule because of the unavailability of high terminal voltage or beams which are not considered routine (as ^{50}Ti or Ca).

The XTU-Tandem schedule for the period September-October is included, the complete schedule until December will be send end of July.

2. Problems with the Target laboratory.

Because of building construction, the Target Laboratory of L.N.L will suffer a reduction of potentiality during the next six months.

In fact we are forced to transfer the Target lab temporarily to an other place, where only a reduced number of instruments will be in operation. It is planned to have working:

1) an evaporator with Joule heater and electron gun;
2) the hidrogenator;
3) the rolling machine at atmospheric pressure;
4) the R.F. evaporator;
5) the high vacuum system for target storage.

The activity of tha Lab, already planned up to the end of the year will include the preparation of target for Tandem experiments as requested by the user at the last PAC meeting. We might have difficulties in handling new, unscheduled requests.

3. The PAC meeting.

The Program Advisory Committee met at L.N.L on May 28, 1993, to review the experimental proposals for the period July-December 1993.

The amount of time to be assigned to new proposals in this period was not sizeable (59 days) since the carry-over from previous periods was not negligible and the time devoted to the next Linac ALPI tests will amount to 15 days.

20 new proposals for Tandem beams were presented to the PAC, accounting for a $\sim$50% more than the available time.

The recommended experiments are listed in Table II.

In view of the pressure on the beam time, especially for Gasp experiments, the PAC stressed that it is absolutely necessary that the proposals be presented orally during the meeting either by the spokesperson or by another participant, in order that the merits of the proposal can be directly compared with others.

3. New target points

A new target point for neutron time of flight measurements described in the next paragraph is in operation.

The Director of the L.N.L. announces to the users that from now new target points requests will be considered only after formal approvals from the PAC.

Two user groups already appointed for putting already existing set-ups on the Tandem-Alpi beam lines receiving the approval from the PAC. The CTNAS experiment, running till now at the Saclay Linac will move to Legnaro in the second part of 1993. In the near future also the HECTOR array is supposed to move from the Niels Bhor Institute to Legnaro.

The installation of new set-ups will force the Lab to plan the decommissioning of old installation not longer in use.

4. A new set-up for neutron spectroscopy on the +30^o beam line of the XTU Tandem

A new target point has been completed on the +30^o beam line. It consists of a 100 cm diameter "spherical" reaction chamber with aluminum thin walls to disturb little the emerging neutron flux.

Ion detectors can now be mounted within its about 1 cubic meter volume. In a short time it is planned a coupling to protruded ion detectors lodgings between 11^0 and 31^0 degree or between -10^0 and 10^0.

Cryogenic and a turbo-molecular pumping assures a good vacuum regime even in the presence of gas detectors.

An array of tubes resembling earth's meridians and parallels, 5 mt. diameter, is mounted around the chamber assuring the arrangement of neutron detectors on several "reaction planes" at various distances from the target and allowing a good TOF measurements for neutron spectroscopy. The total solid angle covered depends only on the number and dimensions of neutron detectors and their distance from the target (1.5 to 3.5 m).

A concrete shielded beam dump stops the beam line at about 4 m. from the target point.

5. Coupling of the Recoil Mass Spectrometer CAMEL with the Gamma Spectrometer GASP

The coupled operation of the recoil mass spectrometer in the "extended" configuration, i.e. including one additional quadrupole doublet lens at the entrance, and the GASP gamma detectors array has been tested in april 1993.

The fusion reaction of 212 MeV ^{58}Ni on ^{64}Ni was used, with target thicknesses of 0.365 and 0.730 mg/cm2. The signals from the BGO multiplicity filter and 36 Ge detectors of GASP were accumulated, together with the X and Y position signals provided by the PPAC detector at CAMEL focal plane and the time of flight from the GASP target to the CAMEL focal plane.

The coincidence condition between the two spectrometers can be imposed or excluded in the off-line data analysis. From the comparison of gamma-spectra with and without such condition the absolute efficiency of the fusion-evaporation residues detection system results to be between about 10% and 15%. The actual value depends on the particular reaction channel, i.e. on the position of the corresponding evaporation residues in the measured mass spectrum. For the used fusion reaction 3 main mass values (A=118, 119 and 120) are observed, all with 3 charge states accepted within the focal plane detector window. The measured mass resolution is 1/300.

Such results are in complete agreement with the expectations based on computer simulations. The coupled operation of the two spectrometers is considered satisfactory even if some technical improvements are still in progress. The system is therefore available for use in experiments approved at the XTU Tandem Accelerator. Persons interested in using the CAMEL spectrometer for gamma-recoil measurements are kindly asked to refer to Dr P. Spolaore at LNL. (E-mail: SPOLAORE@LEGNARO.INFN.IT)

6. The Next User and PAC Meetings

The next meeting of the Tandem-ALPI users will take place in the second half of October. The goal of the meeting is to provide the users with complete information on the possibility of using Tandem and Linac beams during the first half of the 1994 (period to be allocated by the next PAC meeting, which will take place presumably at the end of December).

Detailed information will be sent by E-mail in March.

5. Current list of XTU Tandem beams

In Table III are reported the ion beams (with realistic intensities) available from the source of the XTU Tandem. Some new beams developed and now considered routine (Ge, Zn, Ti) are also indicated. For the next period Mg as well as Ca beams, unsuccesfull till now, will be tested.

It must also be noted that isotopically enriched materials for beam production are normally supplied by the users with some exceptions as ^{18}O.

For more details contact F. Scarpa at L.N.L.

TABLE I

EXPERIMENTS COMPLETED AT XTU TANDEM

IN THE PERIOD JANUARY-JUNE 1993

93.1 Search for octupole correlation effects in ^{147}Pm.
(A.M. Bizzeti-Sona (Firenze)).

93.4 The decay out of the superdeformed band in ^{133}Nd. A thick target experiment.
(S. Lunardi (Padova)).

93.5 Entranche channel effects on the SD-band population in ^{133}Nd. What is the role of reaction dynamics?
(G. Nebbia (Padova)).

93.6 g-factor measurements in the ^{133}Nd superdeformed band.
(C. Rossi-Alvarez (Padova)).

93.9 GDR in hot nuclei with A$\sim$110.
(D. Fabris (Padova)).

93.16 Fluctuation analysis and spectroscopy of high-K bands in ^{163}Er.
(S. Leoni (Milano))

93.18 Search for unfavored components in pseudo-spin alligned structures of doubly odd deformed nuclei.
(G. Lobianco (Milano) and M. Debray (Tandar))

93.21 Excitation energy dependence of the fission probability.
(J.B. Natowitz (Texas) and G. Viesti (Padova)).

93.22 Gamma ray studies of neutron rich products of deep inelastic ^{130}Te+275 MeV ^{64}Ni collisions.
(R. Broda (Krakov) and S. Lunardi (Padova)).

TABLE II: EXPERIMENTS APPROVED BY THE PAC

FOR THE CYCLE JULY-DECEMBER 1993

93.26 Gamma ray studies of neutron rich products of deep inelastic ^{130}Te+275 MeV ^{64}Ni collisions.
(R. Broda (Krakow) and S. Lunardi(Padova))

93.28 Study of the very-proton rich nuclei around mass A$\sim$100
(G. De Angelis (LNL))

93.29 RDDS lifetime measurement in the first superdeformed band of ^{191}Hg
(A. Dewald (Koeln))

93.30 Multiphonon states in ^{232}Th
(J. Gerl (GSI Darmstadt))

93.32 Search for parity violation in the 17/2- isomer in ^{93}Tc
(G. Goldring (Rehovot) and L. Muller (Padova))

93.33 Electromagnetic moments in nuclei with A$\sim$130
(M. Ionescu-Bujor (Bucarest))

93.34 Search for unfavored components in pseudo-spin aligned structures of doubly odd deformed nuclei
(A.J. Kreiner (Buenos Aires))

93.35 Discrete spectroscopy of the "trumpet" ridge and the strongly deformed band in ^{180}Os
(R.M. Lieder (KFA Juelich))

93.36 High energy calibration of BGO detectors
(F. Lucarelli (Firenze))

93.37 Hyperdeformation in the nucleus ^{146}Gd
(S. Lunardi (Padova))

93.38 Test of the new focussed time-of-flight spectrometer
(G. Montagnoli (Padova))

93.39 Search for superdeformed bands in the A$\sim$100 mass region
(C.M. Petrache (Bucarest))

93.40 Precision measurement of fusion barrier distributions of ^{32}S + ^{100}Mo
(F. Schindler (Muenich))

93.41 Dynamics versus statistics in the 1-neutron decay from the ^{156}Er compound nucleus at spin I$\sim$50$\hbar$
(G. Viesti (Padova))

93.42 Search for hyperdefermation in ^{152}Dy
(C. Rossi Alvarez (Padova))

93.43 Molecular and cellular effectiveness of charged particles and neutrons-study of the basic mechanisms involved in the interaction of radiations with living matter
(R. Cherubini (LNL))

93.45 First 2+ g factor in ^{182}Pt and ^{180}Pt
(H.H. Bolotin (Camberra))

TABLE III

Negative Ion Beams currently available at the XTU Tandem

ION	I (nA)	
^{1}H	500	
^{2}H	300	
^{7}Li	200	
^{12}C	3000	
^{13}C	200	
^{16}O	2000	
^{18}O	500	
^{19}F	3000	
^{25}BN	800	for ^{11}B and ^{14}N beams
^{28}Si	600	
^{29}Si	300	
^{30}Si	200	
^{32}S	2000	
^{33}S	400	enriched material
^{36}S	400	enriched material
^{35}Cl	1000	
^{37}Cl	600	
^{49}TiH	1000	
^{54}CrH	100	
^{58}Ni	1000	
^{60}Ni	500	
^{64}Ni	500	enriched material
^{63}Cu	600	
^{65}Cu	300	
^{65}Cu	300	
^{64}ZnO	700	
^{79}Br	800	
^{127}I	800	
^{197}Au	500	

TANDEM XTU SCHEDULE FOR SEPTEMBER-OCTOBER 1993

CALENDARIO TANDEM XTU PER SETTEMBRE-OTTOBRE 1993

Sep. 20-27	93.42	C. Rossi-Alvarez	-10 (GASP)	^{37}Cl 14.3 MV
Sep. 28-30	LINAC			
Oct. 1-7	93.23	P. von Brentano	-10 (GASP)	^{36}S 14.2 MV
Oct. 8-9	93.33	M. Ionescu	+40 I	^{19}F,^{30}Si puls. 13 MV
Oct. 10([1])	93.43	R. Cherubini	+60	
Oct. 10([2])	TANDEM CONDITIONING			
Oct. 11-15	93.35	R.M. Lieder	-10 (GASP)	^{36}S 14.4 MV
Oct. 16-18	93.45	H.H. Bolotin	-10 (GASP)	^{35,37}Cl, ^{28}Si 13.-13.9 MV
Oct. 19-21	93.39	C.M. Petrache	-10 (GASP)	^{30}Si 13. MV
Oct. 22([1])	93.43	R. Cherubini	+60	
Oct. 22([2])	TANDEM CONDITIONING			
Oct. 23-26	93.41	G. Viesti	-10 (GASP)	^{64}Ni puls. 14.2 MV
Oct. 27-29	LINAC			
Oct. 30-Nov. 1	93.34	A.J. Kreiner	-10 (GASP)	^{11}B,^{15}N 13. MV
Nov. 2 - 6	93.32	Goldring/Muller	-40^o RMS	^{32}S 13.3 MV
Nov. 7-14	TANDEM MAINTENANCE & CONDITIONING			

[1] this run will end at 8 p.m.. Beams to be defined.
[2] from 8 p.m..