TANDEM-ALPI

NEWSLETTER

January 1994, Issue No 6

1. Overview.

After a substantial maintenance of the XTU Tandem during the summer time, the user program was successfully resumed on September 20, 1993. In the remaining part of 1993 the Tandem was very stable allowing the completion of several experiment, as reported in Tab.1.

Substantial results have also been obtained in the commissioning of the ALPI superconductive Linac. Test beams from the XTU Tandem-ALPI accelerator complex are expected to be produced during the first part of 1994 and focussed on nuclear targets in the experimental halls.

The Program Advisory Committee was renewed as reported below.

The project of building a third experimental area at the Tandem-Alpi complex has been presented to the I.N.F.N. in the aim of running simultaneously the Tandem accelerator and the ALPI linac when the already funded new injector (ECR source + RFQ + low-β linac) will be in operation (1997). This would result in a sizeable increase of the beam time available in Legnaro.

The XTU Tandem schedule for the period January-june 1994 is enclosed.

2. Status Report of the ALPI Linac at January 1994

By the end of December 1993 the installation in the machine of 13 cryostats has been successfully completed. Further five cryostats are in preparation and will be put in operation within this year. All the ancillary subsystems, including cryogenics, have now the capability to feed 29 cryostats.

The commissioning of the machine has been officially authorized and in the next six months (January-July 1994) six five days beam times have been scheduled for Linac tests. At present we are able to guarantee an acceleration voltage of 12 MV in addition to that of the XTU Tandem and the typical beams will range from ^{28}Si to ^{74}Ge.

Regarding the intensity, the very preliminary tests performed in the last year indicate that the total transmission of the Linac from the image slits of the Tandem analyzing magnet, at the beginning of the Linac injection line, back to the switching magnet which deliver the beams to the various target points, is about 50% without using steerers which are not yet operational. We are confident that when the steerers will be in operation, the transmission might be gradually improved to 80% during this year.

Regularly scheduled experiments with the Linac are supposed to start in September 1994.

3. News from the User Service.

3.1 Status of the Target Lab.

The Target Lab is on the way to be transferred back to its old place. The works are planned to end in January '94. The renewed Lab will be larger in space than the old one. In fact part of the installations (rolling machine, sputtering and RF evaporator) will be placed in a separated room. The schedule for the target production is fully compatible with the re-installation of the Lab and it is expected to fulfill the user requests without problems.

3.2 Up-grading and maintenance of experimental set-up.

The laboratory for germanium detector maintenance has been completed with the annealing set-up, the storage system (up to 12 detectors cooled and controlled) and the test facility.

In the XTU Tandem target room, the 1-m diameter precision scattering chamber ($+20^o$II beam line) has been dismounted to allow the set-up of the CTNAS experimental apparatus.

A new control system dedicated to the Neutron Scattering target point (Bari group, beam line $+30^o$II) is on the way to be mounted.

The quadrupole magnets of the new TOF spectrometer (beam line -20^o) have been installed and tested successfully.

3.3 Status of the common data acquisition systems

The demand for common data acquisition systems reduced significant in the last year; as most complex experiments have dedicated systems.

The two common available systems (MANDA and MANDA FERA) worked during 1993 for less than 10% of the beam time. It has been then decided to shut down MANDA that, with its 14 years old front-end electronics, had serious maintenance problems and to focus on the supporting and developing activities on MANDA FERA.

MANDA FERA is based on a Fera front-end where are plugged 10 Silena 4418/V (80 channels), 5 Silena 4418/T (40 channels) and 3 Silena 4418/Q (18 channels). Fera to NIM interfaces are also available to read NIM ADCs. The system is controlled by a Vaxstation 3100/38 and the data can be stored on Exabyte 8500 or IBM 3480 cassettes. No more 9 tracks tapes are available.

4. The CTNAS target point

The CTNAS (Catania-Napoli-Saclay) collaboration moved its apparatus from the Tandem + Superconducting Linac Accelerator Laboratory of Saclay to L.N.L. to be used with the ALPI beams. The apparatus will be assembled on the $+20^o$ beam line extension and will be operational by the end of May, 1994. It has been specially designed to perform coincidence measurements between γ-rays and charged fragments emitted in heavy-ion reactions. In the Saclay configuration the experimental set-up consisted of a scattering chamber containing the fragment detector system and a surrounding circular rail, about 2.5 m diameter, supporting the γ-ray detector assembly.

The scattering chamber comprises a cylindrical vertical body, 60 cm diameter, with a pyramidal horizontal nose about 1 m long , 70^o and 44^o wide in the horizontal and vertical plane respectively, having its vertex on the cylinder axis. The target holder has a separated small chamber to allow target replacement without vacuum breaking. Charged fragments detectors consist of a gas ionization chamber followed by a silicon strip detector and CsI crystal. Inside the chamber they can be grouped in clusters operating at different gas pressures to optimize the charge identification through a ΔE-E technique. Detectors in the nose can perform mass identification by means of T.O.F. technique.

As the scientific program of the collaboration mainly aimed at studying Giant Resonance excitation in preequilibrium reactions, BaF_2 crystals of the T.A.P.S. standard have been chosen as γ-ray detectors. In the present configuration six clusters, each one made of seven crystals, can be placed in the horizontal plane and/or out of plane at a distance of 30 to 100 cm from the target. If a better energy resolution is needed, a proper number of Ge detectors can be added.

Data acquisition is performed by means of a dedicated system capable to operate up to several hundreds of parameters through the FERA bus in the VME standard.

5. Status of the ISIS project.

The ISIS Si-ball has been completed. It is now composed of 40 Si-telescopes (ΔE=130μm and E=1000μm thickness). The major part of the system has been assembled but still some part of the mechanics and of the electronics is under construction.

A first test of a simplified system using only the ΔE detectors has been recently performed using the ^{58}Ni+^{50}Cr reaction at 210 MeV. Light particles have been detected in coincidence with gamma rays measured with the GASP array and with recoil ions analyzed by the Recoil Mass Spectrometer.

The data is presently being analysed.

6. The PAC meeting.

The Directory Board of I.N.F.N. has renewed the PAC's members for the period October 1993-October 1995. The present PAC members are:

F. Iachello (Yale, Chairman), A. Covello (Napoli), A. Gobbi (G.S.I.), M. Harakeh (Amsterdam), M. Pignanelli (Milano), J. Vervier (Louvain), A. Vitturi (Padova).

The Program Advisory Committee met at L.N.L on December 17, 1993, to review the experimental proposals for the period January-June 1994.

The amount of time to be assigned to new proposals in this period was 76 days since the carry-over from previous periods was not negligible (36 days) and the time devoted to the next Linac ALPI tests will amount to 30 days.

27 new proposals for Tandem beams were presented to the PAC, accounting for a $\sim$40% more than the available time.

The recommended experiments are listed in Table II.

The PAC rules, recently reviewed by F. Iachello, are attached to this Newsletter. The users are warmly raccomended to read the documentation for future submission of proposals.

7. The Next User and PAC Meetings

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

Detailed information will be sent by e-Mail in March.

8. Current list of XTU Tandem beams

A new source (GIC 860 C with a spherical ionizer) was installed in the negative ion injector. It was running successfully from November 25, 1993 providing Ni, Cr, Ge, Si beams. Higher intensity and a better emittance in comparison with the previous source was obtained; as a result, also a significant improvement of the XTU Tandem transmission was observed.

In Table III are reported the ion beams (with realistic long term intensities) available from the source of the XTU Tandem. Some new beams developed and now considered routine (Ge, Fe, V, Ti) are also indicated. For the next period Mg as well as Ca beams, unsuccesfull so far, 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.

9. Rules and Regulations of the Program Advisory Committee

The LNL Program Advisory Committee (PAC) will meet every six months to evaluate proposals for experiments at the Tandem-Alpi accelerator (in the second part of December to evaluate proposals for the cycle January-June and at the beginning of June for the cycle July-December).

Proposal should be sent to the PAC Secretariat c/o Mrs. Carla Piva, INFN, Laboratori Nazionali di Legnaro, Via Romea 4, 35020 Legnaro (Padova), Italy.

Deadlines are :

November 15 for the PAC meeting covering the period January-June

April 30 for the PAC meeting covering the period July-December.

The precise dates of the PAC Meetings will be communicated to all proponents no later than one month before the Meetings. Proponents are asked to present their proposals to the PAC in a 10 minutes presentation with 5 minutes discussion. Proposal that will not be presented will be automatically postponed to the next PAC.

Proposals should contain: (a) the information requested in the scheduling sheets and (b) a scientific report in english (max three pages) which indicates:

(i) the scientific motivation of the proposed experiment;

(ii) some details of the experiment, i.e. description of the instrumentation needed; quantities to be measured; estimated counting rates; etc;

(iii) some information on previous studies with references to previously published work on the same subject.

The PAC decisions will be notified to all proponents at least two weeks before the beginning of the running cycle. Experiment that cannot be performed in the scheduled time for technical reasons will be automatically postponed to the following cycle.

The PAC can also assign, occasionally, a percentage of the available time for accelerator development and digressionary director's time. Special requests should be send to the PAC Secretariat.

TABLE I

EXPERIMENTS COMPLETED AT XTU TANDEM

IN THE PERIOD SEPTEMBER-DECEMBER 1993

93.12 Quasi-elastic proton pair transfer between ground states.
(L. Corradi (LNL)).
93.14 Measurements of short interaction times between heavy-ions.
(F. Malaguti (Bologna) and O. Yuminov (Moskow)).
93.15 Pre-scission neutron multiplicity in the decay of ^{80}Sr.
(L. Fiore (Bari))
93.23 RDDS lifetimes measurements in SD bands of Hg isotopes.
(P. von Brentano (Koeln)).
93.24 Study of the nucleus ^{124}I.
(G. LoBianco (Milano)).
93.28 Study of the very-proton rich nuclei around mass A$\sim$100
(G. De Angelis (LNL)).
93.30 Multiphonon states in ^{232}Th
(J. Gerl (GSI Darmstadt)).
93.31 Search for parity violation in the 17/2- isomer in ^{93}Tc (test) (G. Goldring (Rehovot) and L. Muller (Padova)).
93.33 Electromagnetic moments in nuclei with A$\sim$130
(M. Ionescu-Bujor (Bucarest))
93.34 Search for unfavoured components in pseudo-spin aligned structures of doubly odd deformed nuclei
(A.J. Kreiner (Buenos Aires))
93.36 High energy calibration of BGO detectors
(F. Lucarelli (Firenze))
93.37 Hyperdeformation in the nucleus ^{146}Gd (test)
(S. Lunardi (Padova))
93.39 Search for superdeformed bands in the A$\sim$100 mass region
(C.M. Petrache (Bucarest))
93.41 Dynamics versus statistics in the 1-neutron decay from the ^{156}Er compound nucleus at spin I$\sim$50$\hbar$
(G. Viesti (Padova))
93.42 Search for hyperdeformation 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 (test)
(R. Cherubini (LNL))
93.45 First 2+ g factor in ^{182}Pt and ^{180}Pt
(H.H. Bolotin (Canberra))

TABLE II: EXPERIMENTS APPROVED BY THE PAC

FOR THE CYCLE JANUARY-JULY 1994

94.1 Exotic radioactivity
(R. Bonetti (Milano))

94.2 Detector tests for the Garfield proposal
(F. Gramegna (LNL))

94.5 Radiation damage in Si detectors
(D. Bisello (Padova)).

94.6 The decay of S.D. bands in the A=130 region
(C. Rossi-Alvarez (Padova))

94.7 Final test of the new focussed time-of-flight spectrometer
(G. Montagnoli (Padova))

94.8 Charged particle emission from the light Pb isotopes
(D. Fabris (Padova))

94.9 Fission-Evaporation competition in the decay of ^{200}Pb
(G. Viesti (Padova))

94.10 Search for unfavoured components in pseudo-spin alligned structures of doubly odd deformed nuclei (A. Kreiner (Buenos Aires) and D.R. Napoli (LNL))

94.13 Evidence of linking transitions in the decay out of the ^{148}Gd SD band
(G. De Angelis (LNL))

94.14 Study of the very proton rich nuclei around A=100
(G. De Angelis (LNL))

94.15 Superdeformation in the Nucleus ^{144}Gd
(S. Lunardi (Pd))

94.16 Measurement of the two-neutron correlation functions from the ^{44}Ca compound nucleus (N. Colonna (Bari))

94.17 Study of the nucleus ^{124}I
(G. Lobianco (Milano)).

94.18 Study of the miniorange electron spectrometer
(G. Lobianco (Milano))

94.20 Deformation parameter of ^{192}Os and ^{194}Pt measured by fusion reactions with a ^{16}O beam (F. Scarlassara (Padova))

94.21 Acoustic detection of proton beams in solid targets using tunnelling electromechanical trasducers (R. Onofrio (Padova))

94.22 Lifetime measurement of high spin states in ^{45}Sc nucleus
(P. Bednarczyk (LNL))

94.23 DSAM lifetime measurements in ^{186}Hg for studying shape coexistence
(F. Brandolini (Padova))

94.24 In beam tests for prototype modules of the 8πLP project
(G. Prete (LNL))

93.27b Electromagnetic decay properties of deformation-driving orbitals in ^{161}Lu
(R. Chapman (Manchester))

TABLE III

Negative Ion Beams currently available at the XTU Tandem

ION	I (nA)	
^{1}H	1000	
^{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	1000	
^{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	
^{48}TiH	700	
^{51}V	250	
$^{52}CrH_2$	100	
^{54}Fe	200	
^{56}Fe	200	
^{58}Ni	1500	
^{60}Ni	500	
^{63}Cu	600	
^{64}Ni	500	enriched material

^{64}ZnO	700	tested only on the test bench
^{65}Cu	600	
^{51}VO	500	
^{74}Ge	700	
^{79}Br	800	
^{127}I	800	
^{197}Au	500	

TANDEM XTU SCHEDULE FOR JANUARY-JUNE 1994

CALENDARIO TANDEM XTU PER GENNAIO-GIUGNO 1994

Jan. 24-28	LINAC			
Jan. 29-31	93.26	Broda-Lunardi	-10^o (GASP)	^{64}Ni puls.(1) 15.5-15.7 MV
Feb. 1-6	93.17	W. Korten	-10^o (GASP)	^{29}Si 15. MV
Feb. 7	94.05	D. Bisello	+50^o (S.S.)	p 15. MV
Feb. 8-12	93.32	G. Goldring	-40^o (RMS)	^{32}S 14.1 MV
Feb. 13-17	93.35	R.M. Lieder	-10^o (GASP)	^{36}S (1) 14.4 MV
Feb. 18	94.01	R. Bonetti	+50^o (S.S.)	^{28}Si,^{24}Mg, ^{18}O 7-8 MV
Feb. 19-20	93.38	G. Montagnoli	-20^{o}II	^{58}Ni,^{32}S 12-14.5 MV
Feb. 21-25	LINAC			
Feb. 26-Mar. 3	93.27	R. Chapman	-10^o (GASP)	^{28}Si 14.9 MV
Mar. 4-7	94.16	N. Colonna	+40^{o}II	^{18}O puls. 15.3 MV
Mar. 8-14	93.29	A. Dewald	-10^o (GASP)	^{36}S (1) 14.4 MV
Mar. 15	SERVIZIO DI FISICA SANITARIA			(2)
Mar. 15	94.21	R. Onofrio	+50^o (S.S.)	p (3) 15. MV
Mar. 16	94.24	G. Prete	-40^{o}II	^{12}C,^{32}S 15. MV
Mar. 17-20	93.40	F. Schindler	-20^{o}II	^{58}Ni,^{32}S 12-14. MV
Mar. 21-25	LINAC			

Mar. 26		TANDEM CONDITIONING		(4)
Mar. 26-29	94.22	P. Bednarczyk	-10^o (GASP)	^{37}Cl (5) 15.5 MV
Mar. 30-Apr. 1	94.18	G. LoBianco	+10^o	^{7}Li 13. MV
	MAINTENANCE&CONDITIONING			
Apr. 17	94.24	G. Prete	-40^{o}II	^{12}C,^{32}S 15. MV
Apr. 18-22	LINAC			
Apr. 23-26	94.14	G. DeAngelis	-10^o (GASP)	^{58}Ni 13.5 MV
Apr. 27	94.02	F. Gramegna	+50^o (S.S.)	^{32}S,^{28}Si puls. 13.-14. MV
Apr. 28-30	94.09	G. Viesti	-10^o (GASP)	^{19}F 13.-14.8 MV
May. 1	94.21	R. Onofrio	+50^o (S.S.)	p (6) 15. MV
May. 1-3	94.17	G. LoBianco	-10^o (GASP)	^{18}O (7) 14. MV
May. 3	94.21	R. Onofrio	+50^o (S.S.)	p (8) 15. MV
May. 4-11	94.13	G. DeAngelis	-10^o (GASP)	^{29}Si 13. MV
May. 12	94.05	D. Bisello	+50^o (S.S.)	p,Li,C 14.5 MV
May. 13-15	94.10	Kreiner-Napoli	-10^o (GASP)	^{18}O 13.-15. MV
May. 16-22	94.20	F. Scarlassara	-20^{o}II	^{58}Ni,^{16}O 10-12.5 MV
May 23-27	LINAC			
May. 28-Jun. 2	94.23	F. Brandolini	-10^o (GASP)	^{32}S,^{28}Si 14.-15. MV
Jun. 3	93.43	R. Cherubini	+60^o	(9)

Jun. 4-7	94.23	C. Rossi-Alvarez	-10^o (GASP)	(9) 14.-15. MV
Jun. 8	93.43	R. Cherubini	+60^o	(9)
Jun. 9-12	94.08	D. Fabris	-40^{o}II	^{28}Si 15.1 MV
Jun. 13-17	LINAC			
Jun. 18-25	94.15	S. Lunardi	-10^o (GASP)	^{48}Ti 15.5 MV
Jun. 26	93.43	R. Cherubini	+60^o	(9)
Jun. 27-29	94.07	G. Montagnoli	-20^{o}II	^{58}Ni,^{32}S 13-14.5 MV

(1) Isotopic material provided by the user group.
(2) From 8 a.m. to 5 p.m..
(3) Starting from 5 p.m.
(4) From 8 a.m. to 8 p.m., March 26.
(5) Starting from 8 p.m., March 26.
(6) From 8 a.m. to 8 p.m., May 1.
(7) From 8 p.m., May 1 to 8 a.m., May 3.
(8) Starting from 8 p.m., May 3.
(9) Beam/Beams to be defined.