TANDEM-ALPI

NEWSLETTER

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1. Overview.

The XTU Tandem yielded ~1200 hours of beam on target in the period September-December 1992, allowing the experimental program to be performed nearly as scheduled.

The experiments completed at the XTU Tandem in the same period are listed in Table I.

Furthermore, the XTU Tandem was used for ~25 days to start the commissioning phase of the ALPI Linac and for other tests.

Ten years of the XTU Tandem operation (1982-1991) have been recently reviewed. In the years of normal operation of the accelerator, the Tandem yielded ~4000 hours of beam on target. Including also the results of the years in which major stops of the accelerator happened (1986 tubes up-grade, 1990 portico tests), the average beam on target time is ~3300 hours/year in the whole period of operation.

The major event at LNL in the last months of 1992 was the change of Director.

Prof. P. Dalpiaz has been in charge as Director of the Laboratori Nazionali di Legnaro for two three-years long cycles, as allowed by the present regulation of I.N.F.N.. He quitted on October 31, 1992, being elected as Rettore Magnifico of the University of Ferrara. The Director in charge from November 1, 1992, is Prof. M. Nigro coming from the chair of Director of the Physics Department of the University of Padova.

Prof. P. Dalpiaz encouraged the evolution of the XTU Tandem Laboratory towards an international engagement, during his directorship. He gave a strong and continuous support to the ALPI project and in general to accelerator developments at LNL. We thank Prof. Dalpiaz for that and welcome Prof. M. Nigro, hoping that he will follow the Nuclear Physics program at LNL with the same interest as the previous Director.

The XTU Tandem schedule for the period September-December is attached.

2. The PAC meeting.

The Program Advisory Committee met at L.N.L on December 18, 1992, to review the experimental proposals for the period January-June 1993.

The amount of time to be assigned to new proposals in this period was sizeable (100 days) since the carry-over from previous periods was negligible and the time devoted to the next Linac ALPI tests will amount to only 20 days.

25 new proposals for Tandem beams were presented to the PAC, accounting for a ~30% 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 partecipant, in order that the merits of the proposal can be directly compared with others.

3. A new set-up on the -20^o beam line of the XTU Tandem

A new experimental facility (called PISOLO) is being constructed on the -20^o beam line. It consists of a 30 cm diameter semicircular scattering chamber , where monitors and other small detectors may be placed, followed by a time-of-flight (2.5 m) for heavy reaction products where start and stop signals are given by micro-channel plate detectors (MCP) of 1" and 2" diameters. A split anode ionization chamber is installed downstream the TOF, so that precise energy, ΔE and position information are also available. A parallel plate electrostatic deflector is mounted between the two MCP and is used to detect evaporation residue (ER) at and around 0 degrees. Measured beam rejection factors are in excess of 10^8 for symmetric reactions like ^{58}Ni + ^{60}Ni. ER cross sections have already been easily measured down to 10 μbarn.

The whole set-up can be rotated from -90 to +150 degrees and is compact, reliable and easily operated.

The solid angle is in the range 0.1-0.5 msr, depending on the geometry one needs. Within 1993 a magnetic lens will be added, in order to have a gain in effective solid angle of a factor 10-20.

It is also planned to perform kinematical coincidences between small arrays of detectors in the scattering chamber and the long TOF arm; with typical Linac beams and quasi-elastic reactions on heavy targets we expect to have a mass resolution arround 1/200, provided the TOF length is extended to 4 m. The new set-up will have complementary characteristics with respect to the existing recoil mass spectrometer where the electric rigidity of the ions puts severe limitations to the study of direct reactions with Linac beams.

4. 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 1993 (period to be allocated by the next PAC meeting, which will take place presumably at the beginning of June).

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 partially developed but not considered routine are also indicated. For the next period Ti as well as Ca beams 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 SEPTEMBER-DECEMBER 1992

92.6 Lifetimes of superdeformed states in ^{146}Gd
(P. von Brentano (Koln)).

92.8 Study of the very proton rich nuclei as a test experiment for the GaSp spectrometer
(G. de Angelis (LNL)).

92.17 Quasi-elastic proton pair transfer
(J. Gerl (GSI)).

92.20 Near yrast nuclear structure investigation of doubly odd Lu isotopes
(D.R. Napoli (LNL) and M. Debray (Tandar))

92.21 GDR broadening and disappareance in hot nuclei
(D. Fabris (Padova)).

92.22 Development and test of detectors for charged particles
(G. Prete (LNL)).

92.23 Liquid scintillator detector response function to neutrons
(A. Pantaleo (Bari)).

92.25 Detailed measurements of fusion cross-section of ^{58}Ni+^{60}Ni around the Coulomb barrier
(A.M. Stefanini (LNL)).

92.26 Search for resonances in heavy ion reactions
(U. Abbondanno (Trieste)).

92.27 A search for hyperdeformed bands: fluctuation analysis, rotational mapping and studies of discrete structures in ^{184}Pt
(R. Bark (N.B.I.)).

92.28 High spin states in ^{45}Sc via fusion-evaporation reactions
(W. Meczynski (Krakov)).

92.29 Measurement of gyromagnetic ratios and half-lives in fusion reactions
(F. Brandolini (Padova)).

92.31 Search for extremely deformed shapes in light Pb isotopes
(W. Korten (N.B.I. and Bonn))

TABLE II: EXPERIMENTS APPROVED BY THE PAC

FOR THE CYCLE JANUARY-JUNE 1993

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

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

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)).

93.10 Fusion reactions of ^{40,48}Ca+^{48}Ca at energies close to the Coulomb barrier.
(A.M. Stefanini (LNL)).

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))

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

93.17 A study of excited superdeformed bands in ^{194}Hg.
(W. Korten (N.B.I. and Bonn))

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)).

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)).

93.25 g-factors measurements of T=1/2 mirror nuclei in the pf shell. A mass spectroscopy study of ^{57}Cu.
(G. Goulding (Rehovolt) and I. Muller (Padova)).

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	700	under development
^{54}CrH	100	
^{58}Ni	1000	
^{60}Ni	500	
^{64}Ni	500	enriched material
^{63}Cu	600	
^{65}Cu	300	
^{74}Ge	700	under development
^{79}Br	800	
^{127}I	800	
^{197}Au	500	

TANDEM XTU SCHEDULE FOR FEBRUARY-JUNE 1993

CALENDARIO TANDEM XTU PER FEBBRAIO-GIUGNO 1993

Feb. 1-10	93.03	S. Lunardi	-10 (GASP)	^{50}Ti 15.5 MV
Feb. 11	Dir	BEAM LINES ALIGNEMENT +60, +50, +40		
Feb. 12	92.25	A.M. Stefanini	-20 II	^{58}Ni puls. 15.5 MV
Feb. 13-14 ([1])	93.23	P. von Brentano	-10 (GASP)	^{36}S 14.5 MV
Feb. 14 ([2])	Dir	R. Bonetti	+50 (SS)	^{12}C 7 MV
Feb. 15-18	93.04	S. Lunardi	-10 (GASP)	^{32}S 12-14 MV
Feb. 19-22	93.01	A. Bizzeti-Sona	-10 (GASP)	^{11}B([3]) 9-11 MV
Feb. 23-Mar. 4	LINAC			
Mar. 5 ([4])	Dir	Servizio di Fisica Sanitaria		
Mar. 5	TANDEM CONDITIONING			
Mar. 6	TEST OF GASP Dir	C. Rossi-Alvarez	-10 (GASP)	14.5 MV
Mar. 7-10	93.05	G. Nebbia	-10 (GASP)	^{32}S,^{60}Ni 15-15.4 MV
Mar. 11	Dir	BEAM LINES ALIGNEMENT +60, +50, +40		
Mar. 12-16	93.22	Broda/Lunardi	-10 (GASP)	^{64}Ni 15.5 MV
Mar. 17	Dir	BEAM LINES ALIGNEMENT +60, +50, +40		
Mar. 18-22	93.09	D. Fabris	-40^{o}II	^{32}S 15.5 MV
Mar. 23-26	93.24	N. LoBianco	+10 (MIPAD)	^{7}Li 13 MV
Mar.27-Apr.2	93.16	Leoni/Bracco	-10 (GASP)	^{18}O 12-14 MV

Apr. 3-4	Dir	A.M. Stefanini	+20 II	p 7-8 MV
Apr. 5-15	TANDEM MAINTENANCE & CONDITIONING			
Apr. 16-21	93.12	L. Corradi	-20 II	^{52}Cr 14-15.5 MV
Apr. 22-27	93.21	Natowitz/Viesti	-40^{o}II	^{19}F 13-15.5 MV
Apr. 28	 Dir	RADIOBIOLOGIA [5] R. Cherubini	 +60	
Apr. 29-May 1	TEST OF GASP-RMS Dir	 C. Rossi-Alvarez	 -10 (GASP)	 14.5 MV
May 2	 Dir	RADIOBIOLOGIA [5] R. Cherubini	 +60	
May 3-9	93.10	A.M. Stefanini	-20 II	^{40,48}Ca 11-14.5 MV
May 10	TEST OF GASP Dir	 C. Rossi-Alvarez	 -10 (GASP)	 14.5 MV
May 11-13		C. Rossi-Alvarez	-10 (GASP)	^{58}Ni, ^{64}Zn 14-15. MV
May 14	 Dir	RADIOBIOLOGIA [5] R. Cherubini	 +60	
May. 15-20	93.17	W. Korten	-10 (GASP)	^{48}Ca,^{13}C 15 MV
May 21-25	93.18	Krainer/LoBianco	-10 (GASP)	^{16,18}O, ^{14}N-^{11}B (^{3}) 14.-15. MV
May. 26	92.20	Napoli/Debray	-10 (GASP)	^{28}Si,^{19}F 14.5 MV
May 27-30	93.15	L. Fiore	+30II	^{28}Si 15.5 MV
May 31-Jun.6	93.23	P. von Brentano	-10 (GASP)	^{36}S 14.5 MV
Jun. 7-13	TANDEM MAINTENANCE & CONDITIONING			
Jun. 14-23	LINAC			

Jun. 24	TEST OF GASP-ISIS			
	Dir	C. Rossi-Alvarez	-10 (GASP)	14.5 MV
Jun. 25-28	93.14	F. Malaguti	+50 (SS)	^{32}S, ^{16}O 14-15 MV
Jun. 29-Jul. 2	93.25	Goldring/Muller	-40^{o} RMS	^{32}S pulsed 9-10 MV

[1] this test will end at 8 p.m., Feb. 14..
[2] from 8 p.m., Feb. 14, to 8 a.m. Feb. 15.
[3] after tests of the Servizio di Fisica Sanitaria.
[4] Test of the interlook and safety chains system.
[5] to be confirmed.
Dir = Director's Time
CS1m = 1 m diameter scattering chamber (+20 II beam line)
GASP = Gamma-ray Spectrometer
SS = Sliding Seal scattering chamber
RMS = Recoil Mass Spectrometer
MIPAD = 6 Ge gamma array