CH/Doc/98/02

Minutes

Charissa GANIL Meeting

Held on: Friday, 30 October 1998, 2.00 pm

Held at: Surrey

Agenda

1. Discussion of next experiment, E281a in June/July 1999
2. Present grant spend
3. PAC proposals due Nov 1998: GANIL, ANU
4. New grant proposals: TiaRA, GP array

Minutes

The meeting was organised at short notice, taking advantage of Nigel Orr's UK visit. Present: WNC, MF, NMC, NAO, NC

1. **Next experiment:**
   This experiment is with a ^{17}C beam to look at both clustering in ^{16}C (Birmingham) and unbound resonances in ^{16}B (Surrey) and will require telescopes with PID a well as DEMON for neutrons. Whilst technically due on May/June/July, May running is unlikely.

   The beam is anticipated to be 5,000s^{-1} of ^{17}C at 35 MeV/A. For comparison, the optimised ^{16}C intensity would be 20,000s^{-1}.

   DEMON will span neutron angles of $\pm 20°$.

   Several schemes were discussed to satisfy the dual demands of the cluster measurement and the core+n reconstruction. The conflicts are between

   (a) uncompromised energy resolution for stopping detector (core energy)
   (b) segmented stopping detector(s) very close to zero degrees (breakup)
   (c) high count rate capability for stopping detector (20 kHz)
   (d) ability to stop ^{6}He from breakup (hence thick CsI)
   (e) minimal scattering for neutrons (hence thin CsI)
   (f) minimal reactions in stopping detector (low neutron production)

   Several possibilities for detector configurations were discussed at length, including an option where beam-like particles were stopped in a Si(Li) whilst ^{6}He continued to CsI. The situation was not resolved. Some relevant ranges are given in the table, but note that these are all for the beam velocity and breakups can be boosted above (and below) this velocity.

ion	37 MeV/A	R(Si) mm	R(CsI) mm
^{17}C	629	3.44	2.70
^{15}B	555	4.36	
^{12}Be	480	6.25	
^{4}He	148	7.24	5.66
^{6}He	222	10.86	8.50

NMC reported that he had been collaborating with Paisley on packaging the Charissa preamplifiers into standard NIM bin modules, and showed a module that he had recently built as a prototype. Six modules could fit into one NIM bin, giving 96 channels per NIM bin. Eight modules (128ch) would be ready for the planned experiment.

Jobs for May 1999 @ GANIL

(a) Detector mounts $\boxed{\text{MF,NMC}}$

(b) Cables except as noted in next three items $\boxed{\text{NMC,MF}}$

(c) Cables (lemo) from preamps to amplifiers $\boxed{\text{WNC}}$

(d) Cables (shielded twisted pair ribbons) from amps to Silena adc's $\boxed{\text{WNC}}$

(e) Investigate present patch panels between D6 and INDRA room $\boxed{\text{NAO}}$

(f) Patch panel solution if existing situation insufficient $\boxed{\text{WNC,NAO}}$

(g) Preamps (100 piggie-backs or replacements by May) $\boxed{\text{NMC,WNC,RCh}}$

(h) Collection of sufficient amplifiers at GANIL $\boxed{\text{WNC}}$

(i) Collection of sufficient preamplifiers at GANIL $\boxed{\text{NMC}}$

(j) Collection of sufficient adc's and tdc's at GANIL $\boxed{\text{MF}}$

2. **Grant spend:**

The state of the GANIL component of the grants was reviewed. The initial allocation was split approximately equally between Birmingham (125K) and Surrey (129K), taking into account equipment and running costs. The table shows the spend in £K. Also included are the following purchases agreed at the present meeting: (a) extra 64 channels of CAEN electronics including discriminators and high power bin, esimate 35K (B'ham), and (b) first purchase of 6 VXI C-size ADC modules, estimate 30K (Surrey). Replacement detector costs, shipping and repair costs, and detector development costs are also shown.

This summary represents the monies presently allocated until January 2001.

Item	Budget	Spend	Group	Description	Balance
Equipment	171	30.5	Surrey	64ch amp+disc+crate	
		8.5	Surrey	16ch amp+disc+control	
		2.0	Surrey	extra NIM crate	
		5.0	Surrey	PC,scope,connectors	
		30.0	Surrey	VXI C-size ADC's	
		35.0	B'ham	64ch amp+disc+crate	
Replacements	52				
running costs	18				
Development	13				
TOTALS	129	76	Surrey		53
	125	35	B'ham		90
	254	111	All		143

There was discussion of the relative merits of C-size and D-size ADC modules of the type built by GANIL. In the light of recent discussions in the Exogam electronics meetings, it had become apparent that complete compatibility with Exogam could not be ensured at the same time as compatibility with the rest of the GANIL systems, owing to the modified D-size modules (for buffered output) employed by Exogam. Costwise, there was a negligible difference at the 128 channel level and a total of 10% saving (5K in £50K) potentially for D-size for 256 channels. However, only the C-size could be assured of being compatible with the new GANIL standard DAQ system, and for use with DEMON and other non-Exogam systems.

It will be necessary to monitor the situation with regard to using Exogam with its own VXI electronics. That system will supply 128 channels of GANIL ADC inputs that our signals can be coupled to, so any more channels than this would possibly need to be purchased by us at a cost of £7.5K for 64 channels £15K for an extra 128 channels to give a total of 256 channels.

A discussion identified some of the items foreseen for extra expenditure. It was noted that NAO at LPC has the situation in hand with regard to essential crates, computers and tape drives. An extra 64 channels of amplifiers and discriminators (Birmingham) and 192 channels of C-size ADC's (Surrey) were agreed, as included in the table. In addition to possible duplication of parts of the DAQ, the following items were identified for the future. The list was not intended to be complete.

(a) extra/modified preamplifiers

(b) VXI tdc's

(c) scalers (VME?)

(d) annular detector prototype

(e) new masks for TiaRA prototypes (barrel/annular)

(f) different strip detectors for zero degree telescope

(g) possible link to detectors for ^{6}He fusion experiment at Louvain

3. **PAC proposals:**

The current situation was reviewed with regard to proposals for related work at other labs. There was to be a meeting at York to discuss ANU proposals, but discussions at Birmingham, Oxford and York has tentatively identified a scheme to run Oxford, York and Birmingham experiments at Easter (SPGC, RLC/Barry, Marie-Paul) and Birmingham experiments in September (MF, NMC). MF proposed a new version of MEGHA using 70μm ΔE quadrant detectors from Micron. WNC planned to write a proposal compatible with this detector setup. The MF, NMC and WNC proposals would relate to GANIL work.

MF and NMC reported that they were planning similar proposals for Strasbourg, for the PAC due in mid January 1999.

JSW/WNC/NAO were preparing a GANIL proposal for the November 1998 PAC to study the reaction ^{12}Be(p,d)^{11}Be in inverse kinematics using Exogam detectors to separate the two bound states in ^{11}Be.

Brief discussion was given to the possibility of using the SPIRAL beam of ^{24}Ne, or of writing a letter of intent regarding a future ^{17}Ne beam with the (d,^{3}He) reaction, but no definite conclusions were reached.

4. **New grant proposals:**

Two areas of work had been identified to have new equipment requirements: transfer reaction work and cluster breakup work. Also in the first category, coulex could be included since the detector requirements worked out to be similar. This area is addressed by the TR/A proposal. For breakup work, and for more general applications at GANIL, a General Purpose Array was envisaged perhaps with an associated beamline. WNC was preparing the TR/A request and MF was preparing the GPA request.

There was a discussion of what the TR/A proposal was envisaged to involve. WNC indicated that he envisaged a request where the equipment and manpower components were mainly associated with Surrey, Birmingham, Paisley and Daresbury. The Surrey and Daresbury parts would cross the charged-particle gamma-ray traditional barrier. It would be necessary to discuss how to ensure that the other Charissa collaborators were involved in a suitable way. The situation with Manchester and Liverpool involvement was not resolved.

WNC briefly outlined the main components envisaged for the physics case and the equipment bid for TR/A as follows:

The physics case would be based on transfer reactions and multiple coulex, with fusion evaporation mentioned as one possible extra application once the TR/A is built. It was felt that other devices could deal with much of the fusion evaporation work, but that there may be specialised application involving gamma-rays below $\sim$ 400 keV for which TR/A would be ideal; however, this could not be part of the primary case.

(a) Physics Case

  i. *Transfer reactions*
  (Surrey, Daresbury, Birmingham, Paisley, Manchester)
  ii. *Multiple Coulex studies*
  (Surrey, Daresbury, Liverpool?)
  iii. *Fusion Evaporation studies*
  (Surrey, Daresbury)

(b) Equipment

  i. Chamber
  ii. New designs of detectors
  iii. Detectors and spares
  iv. Pumps
  v. Design effort at Daresbury
  vi. Preamplifiers
  vii. RA support
  viii. Electronics support
  ix. Mechanical support
  x. Dipole vacuum box for SPIC magnet
  xi. Extra NIM electronics and ADC's up to 256 channels
  xii. Associated analysis computing
  xiii. University infrastructure and consumables
  xiv. Travel (experiments, meetings, administration)

WNC and NAO would reconvene the following day, to construct a detailed list covering the reaction chamber specification and associated hardware.

Attachments:

1. List prepared by WNC and NAO for TR/A reaction chamber
2. Summary of meeting at Daresbury 9 Dec 98 to discuss design for costing

W.N. Catford 9 December 1998

Meeting to Discuss Hardware Specification of TR/A Chamber

Present: WNC and NAO Location: Guildford 31 October 1998

The various components of TR/A construction can be grouped together as follows:

1. beam tracking modules
2. target module
3. zero degree module
4. magnet module

The various design and construction tasks for these modules have been identified as follows:

1 Beam Tracking Modules

1. Two beam pots for PPAC housings (parallel plate avalanche counters designed by LPC Caen) with 200 mm OD and feedthroughs and mountings for the PPACs
2. Two tracking detectors
3. Two gas handling systems and associated feedthroughs and connections
4. Two mask calibration systems for PPAC positions
5. Pumping for the beam tracking modules and a support stand
6. Large diameter valves between modules and between target module and second tracking module
7. Electronics for the trackers: HV, TAC's and CFD's
8. Back-angle annulus and its feedthroughs (should this be in target module?)

2 Target module

1. Target mounting and changing system (no vacuum exchange required)
2. Back-angle annulus (should this be in PPAC module?)
3. Target barrel module (thin walls). Can be square cross section or cylindrical. Must flare out to allow particles to escape from target at 35 degrees to beam direction. Must include electrical feedthroughs for 6 strip detectors. Can be made of aluminium, carbon fibre, teflon etc at least in part, although this conflicts with flaring the exit.

4. Six silicon detectors - could be standard 16 strip, 50×50 mm^2 detectors with ribbon connectors, or else a custom design that could be longer and perhaps with fewer strips.
5. Mounting frame and support for silicon detectors
6. Replacement detectors – one replacement set per year
7. Supports for exogam detectors
8. Electronics for 4 exogam detectors
9. Cable routing – cables and racks
10. Cable feedthroughs/patch panels
11. preamplifiers
12. Extra silicon electronics to complete to 256 channels

3 Zero degree module

1. Basic box $500 \times 300 \times 300$ mm^2 approx. Pumping on base. Feedthroughs on side, for annular detector and zero degree detectors. Access through lid on top to allow alignment of detectors and cabling attachments etc. Back plate should be as thin as possible to allow neutron use, but it must be possible to see through along the beam line with a telescope, and if at all possible then coupling to VAMOS should also be possible. Note that VAMOS can come as close as 400mm from target to flange. Acceptance of VAMOS is +/- 10 degrees in this geometry. The neutrons impose a requirement of +/- 20 degrees to be kept free of significant thicknesses of material.
2. Annular detector, 5 inch diameter wafer, mounted so that 5 inches minus 5mm subtends 35 or 40 degrees at target position, when mounted at the middle of its variable distance mounting relative to the target.
3. Backing detector (design for silicon) for annulus, same dimensions. May in the future need to be upgraded to a more massive detector, for example several segments of CsI.
4. Sliding rails with mount for annular detector, with distance markings for example using a steel rule screwed down. Minimum distance from target will mean that outer edges are obscured from the target, but this will allow the central hole to appear bigger from the target so this is OK.
5. PPAC for fragment tracking
6. Gas handling for above

7. Detector telescope at zero degrees, approx 400mm from target. For example an arrangement of 2 Si strip detectors $50 \times 50 rm\ mm^2$

   backed by a Charissa style CsI 10/20mm thick. Alternatively a phoswich detector. Telescope mounting to double-dowel in place, to allow removal for optical alignment.

8. Pumping for zero degree module, with support stand

9. Electronics for PPAC (HV, CFD's and TAC's)

10. PPAC calibration mask system

11. The back wall could mount onto VAMOS, by removing a flange at the back, and in this case a valve at the coupling point would be desirable.

4 Magnet module

1. Vacuum chamber for SPIC magnet belonging to LPC. Shape to be determined but possibly a rectangular box $500 \times 300 \times 300$ mm^2 approx with, built on to it along one side, an extension resembling part of another box of the same general dimensions impaled at an angle. The back plate of this extension would be removed for access to focal plane detector. Detector itself to mount off the base of the vacuum box. Electronic feedthroughs to come through the side wall.

2. Pumping for above

3. Feedthroughs for focal plane detectors

4. Rails for "focal plane" detectors

5. One detector at the focal plane to be independently movable (remotely) with respect to the main detctors (this will be a phoswich detector to catch and measure the beam)

6. Copy of detector telescope as used in the zero degree module, with independent movement

5 Electronics channels

We assume a system with a hex-box of detectors in the target module, with 8 strips per detector as far as instrumentation is concerned, and an annular detector with 32 resistive strips (either radial or annular) or up to 64 non-resistive strips. In addition, we take account of the beam tracking (three PPACs), a highly segmented zero degree passing detector (two, crossed, resistive strip detectors), a stopping detector each for the annulus and the zero degree telescope, a PPAC for zero degree tracking, and a phoswich to catch the beam around the magnet.

Table 1: Channel count, for the basic configuration, and the extensions in which the rear annulus can be used simultaneously and where the rear hexagonal box is also installed. In the first instance, 256 channels of energies are sufficient, but an increase is required to deal with the rear detectors necessary for coulex and stripping (e.g. (d,p)) studies.

Detector	energy	time	fast timing?
$PPAC_0$	4	1	1
$PPAC_1$	4	1	1
$PPAC_2$	4	1	1
rear annulus	(64)	1	
rear hex box	[96]	6	
main hex box	96	6	
front annulus	64	1	
front backing	8	1	
$PPAC_3$	4	1	1
$SiSPSD_1$	32	1	
$SiSPSD_2$	32	1	
CsI	1	1	
Phoswich	2	2	1
Total (base)	247	17	5
Total (rear annulus)	311	18	5
Total (also rear hex)	407	24	5

The next extension of the setup is to include another annulus at the backward angles, for simultaneous (and not just alternative) operation, and beyond that the next extension would be to fill in the missing part of the box behind the target position, between the target and the rear annulus.

For the time being we assume that the CsI at zero degrees is not segmented, and that the stopping detector behind the annulus at the front can be operated using a maximum of 8 signals.

W.N. Catford 2 December 1998

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Minutes

Charissa GANIL Meeting

Held on: Wednesday, 9 December 1998

Held at: Daresbury

Present: WNC, RCL, RAC, GJH

Graham Houghton (Daresbury engineer) was present, to discuss the detailed description provided by the list produced by NAO and WNC on 31 October, together with subsequent input during discussions with RCL, MF and NMC at Daresbury.

The aim was to provide sufficient information for a costing of the construction and the detailed design effort to be estimated.

WNC reported that his discussions with Eurisys had indicated that 5-inch annular detectors were possible. However, in addition, discussions with Colin Wilburn at Micron had indicated that 6-inch technology was available. This would allow the annular detector to be placed 6/5 of the distance from the target relative to that previously envisaged, which would relax the problem of making the central hole small enough. Further, Micron confirmed that they were able to supply strip PSD's that were up to 120 mm in length, and these could be supplied with a width that best suited the TR/A design. Up until now, standard 50×50 mm^2 PSD's had been assumed as a starting point, for the barrel, but the longer ones (possibly narrower at say 45 mm wide) offered many advantages. In order to maximize the advantages of a compact design for detectors around the target, the cost of new masks for different designs of detectors was certainly justified.

Micron had indicated that a variety of options were available for making the connections to the detectors in the barrel, for which the signal extraction presented a challenge due to the space limitations.

Amongst the points agreed during the discussion were the following:

1. The complete assembly of zero degree telescope, forward annular detectors and target-surrounding barrel would be mounted off the back flange,
2. The back flange would comprise a removable inner ring of very thin material extending out to $\pm 25^{\beta}$ to minimize neutron scattering. The outer ring would be substantial to give stability and support the inner detector structure cantilevered off of it,
3. The back flange would be supported on legs which would be connected to rails

that would allow it to be slid back, out of the vacuum vessel, and would allow it to be slid reliably back into position,

4. Electrical feedthroughs for all detectors would exit through the outer ring on the back flange,
5. The target barrel vessel would be of a low atomic number material (aluminium, carbon fibre) to minimise low energy gamma attenuation and would most likely include the sloping walls fanning out to the forward angles; beyond this point it would connect via a flange to the rear (zero degree) module,
6. The side walls of the rear module could be quite thick, for stability,
7. The backplate of the rear module would be 400 mm from the target, to keep compatability with VAMOS,
8. The various detectors in the zero degree module would mount on standard mounting frames/supports that were connected to the inner support rails in a reliable fashion,
9. The annular detectors would be movable and the position measureable, along the beam direction,
10. The zero degree telescope at the rear would be removable for alignment along the beam axis,
11. The central (thin) part of the rear flange would be similarly able to be removed for alignment,
12. The nominal sizes for the separate PPAC vacuum vessels would be cylinders of diameter 200 mm and length 200 mm with entrance and exit beam ports,
13. The PPAC vessel nearer the target would include both a means to mount the annular detector at the backward angles (between the PPAC and the target) and a means of putting the target in position,
14. In view of the difficulty in getting a target in to position, it would only be possible to have one target at a time (plus the no-target situation); hence, it would be necessary to be able to change targets without cycling the vacuum,
15. The target would be mounted on the end of an insertion rod (which would necessarily obstruct part of one silicon detector in the barrel) and could be withdrawn into a transfer port where it could be changed,
16. Different tips would be used on the target insertion rod, according to the appropriate target angle relative to the beam; these would all need to fit through the vacuum transfer valve and any guides for the rod,
17. The rod would have some type of collar that would ensure that it was properly aligned at the point of entry into the vacuum, in the inserted position,

18. The rod could if necessary be in sections as done at ANU, so that it did not create a precarious situation, or foul on other equipment along the beamline when extracted,

19. The means of mounting the Exogam detectors would be based on the regular Exogam support frame, but with any (costly) unnecessary features pruned from the design,

20. Most likely, the framework for only the 90^{β} detectors would be copied,

21. Some support for the vacuum vessels was needed, apart from the beamline, but any connection to the Exogam framework (or its copy) should *not* be to a part that moves when Exogam is opened for access,

22. The TR/A should be able to be used inside the actual Exogam support frame, as well as in the clone of the frame, for G2 beamline running,

23. The clone of the Exogam support structure should be designed to allow running on the D6 LISE platform,

24. A gas handling system to operate the beam tracking PPAC's would be included in the costing,

25. Pumping, probably through the nearer PPAC beam pot, would be included.

It was agreed to meet again in mid-January 1999 to assess the situation and hopefully discuss with the designer. It was hoped that detailed design could commence at the end of January or beginning of February, with a view to producing a rapid costing in time for a March grant submission. RCL,GJH

Pumping and gas handling costs would be estimated. RAC

Check worst-case radioactivity accumulation on target changer. WNC

Details of LPC PPAC designs and beam pots should be obtained and forwarded to GJH, plus details of typical annular detector mount and GANIL beamline diameter. WNC

W.N. Catford 9 December 1998