**Minutes**

Charissa@GANIL Meeting

Meeting held on: 21 November 1996

Meeting held at: Birmingham

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| Present: | WNC, SPGC, NMC, NC, MF, Nigel Orr, SMS, J.S. Winfield |
| Distribution: | above,char-meeting@nnga.dl.ac.uk by e-mail/file-server |

# Minutes

1. Summary of GANIL timescales

The next deadlines are 3 Jan 1997 for proposals (PAC meets 19-21 Feb 1997) for GANIL and 31 Jan 1997 for Letters of Intent for SPIRAL.

DEMON is likely to arrive 1 May 1997, to stay until end Nov 1997. It will likely run in target room D6 (LISE line) in June/July with the same chamber as the first $^{19}C$ run. In August it will switch to another area for reaction mechanism studies.

Proposals (probably two) are planned, for neutron breakup experiments with DEMON in June/July.

SISSI is presently not completely fixed. It has been put back into the beamline without the cryogenics being rebuilt. It is believed that a backup system is to be added. It is essential for the transfer experiment that SISSI operates properly. A letter expressing our keen desire for this to happen should be sent to the Director of GANIL. WNC

INDRA has approved experiments for 1997, and together with other approved experiments this means that there is very little time available for distribution by the PAC. There will be ~20 weeks of beam in 1997, with ~80 UT left for distribution by the PAC after subtraction of experiments postponed from 1996 and tests of the intensity upgrade.

2. Planned experiments for 1997

The transfer experiment (neutron pickup from beryllium isotopes) should be requested for early April 1997. JSW and WNC should agree a letter to the GANIL committee, together with Simone Fortier (Orsay). WNC,JSW

The breakup experiment will be requested for running during the DEMON period in June/July. It may be somehow combined with the DEMON system.

## 3. Planning for SPEG transfer experiment

The plan is to prepare software and gather equipment in Feb 97, set up in the SPEG chamber and test with alphas in March, and do the experiment in April 97.

Two preamp boxes are complete at Birmingham. These can deal with 16 sheet PSD's, up to 80 channels.

The amplifiers are potentially a problem. Paul Jagpal will be able to work on the new amplifiers only after he returns from working on the MEGHA system in Feb 97. Hence it will be necessary to recover amplifiers from Australia to be sure that there are sufficient available. The amplifiers are needed in Australia for backup in the Jan/Feb 97 running at ANU. They will need to be included in the shipment back to the UK at the end of that running period. There are 80 amplifers in this category. SPGC and NC will be at ANU and will deal with the packing. SPGC,NC

The bias supplies that were brought back from ANU for the transfer experiment were subsequently shipped back to ANU for the November 96 running. Twlelve of the compensated Charissa bias supplies should be shipped back to the UK at the end of the Jan/Feb 97 running at ANU. SPGC,NC

There will also be a need for various ADC's, TDC's and logic units. A list should be provided to SPGC. WNC

The experiment will use the standard GANIL data acquisition system, with the PSD's providing extra parameters in addition to the standard SPEG energies, times and beam tracking measurements.

The preference is to use GANIL ADC's for the 50 energy parameters - i.e. it needs to be established whether 7 of these can be found. Then, it will be necessary to write the appropriate acquisition code to read these extra parameters. The coding for this would best be done in February 97 when JSW is back in GANIL and SMS is back from Australia. JSW,SMS

If it is not possible to locate enough GANIL ADC's then it will be necessary to locate 7 of the Charissa Silena ADC's. MF

In any case, it would be useful to send JSW a copy of the Silena manual to investigate how to read these modules with the GANIL system. WNC

The 10 Eurisys 500 $\mu$m sheet PSD's ordered through Birmingham have not arrived; they were due in Sep 96. The suppliers should be contacted about this. $\boxed{\text{MF}}$

As a backup, the 12 Hamamatsu 300 $\mu$m detectors previously identified for replacing the Eurisys detectors, and since shipped to Australia, should be returned to the UK at the end of the January running. $\boxed{\text{MF}}$

The prototype mount for the sheet PSD's was inspected at the meeting. The final mounts now need to be made, as soon as it is known what detectors will be used. The construction of these boards should be completed by the end of Feb 97 so that they can be installed in SPEG in March. $\boxed{\text{MF}}$

The chamber mounts to support the PCB's in the SPEG chamber need to be started. The exact details of how to join to the couronnes should be obtained, and the details of the mounts should go to the Birmingham workshop before Christmas. $\boxed{\text{MF}}$

In January, the construction in the Birmingham workshops should be monitored. $\boxed{\text{NMC}}$

The available targets from the stocks of F. Auger should be ascertained. $\boxed{\text{JSW,WNC}}$

The cabling of the PSD's through the vacuum wall, to the preamps, is now sorted out. JSW has had the cables for inside the vacuum (INDRA to INDRA type) and the cables for outside the vacuum (INDRA to multiple Lemo's) manufactured. The BNC cables from the preamp outputs in SPEG to the Charissa amplifers in the SPEG acquisition room exist, and since the recent MUST tests they have patch panels also.

## 4. Planning for LISE breakup experiment

This experiment will use sheet PSD's backed by CsI's, in the DEMON target chamber built by LPC. The mounts will be made from PCB's, similar to the SPEG mounts, but more substantial, to support the CsI. It is planned to use 10 telescopes.

The experiment will employ the Charissa data acquisition system. Some software support will be needed to set up the LAN etc. for the SUN system on site in GANIL. $\boxed{\text{SMS}}$

NAO asked for documentation on the DA system, to pass to his local computer experts. $\boxed{\text{MF}}$

It is hoped that NAO can get support for data acquisition software, but the need to use SUN hardware is a problem. Supporting information for having to use SUNs should be obtained by consultation with V. Pucknell and emailed to NAO. $\boxed{\text{SMS}}$

The beam spot on LISE is $\lesssim$ 12 mm diameter and approximately $\pm 1^\circ$ divergence.

It is planned to use the telescopes also for the neutron breakup experiments with DEMON. For this, the same array geometry should be used. NAO mentioned that a detector that could be placed at zero degrees would be useful for when the beam intensity is very low, e.g. $^{14}$Be beam.

The method for calibrating the CsI energies needs to be thought about.

The standard LISE signals required in the breakup run are: the tof TAC for beam ID, the 5 TDC outputs for the 2 tracking detectors, and one $\Delta$E signal.

Schematic triggering diagrams and CsI array geometries should be produced for the breakup experiment and for the DEMON experiments, and they should be compared with a view to running the two experiments at once. $\boxed{\text{NAO,MF}}$

The Charissa amplifers give two bipolar outputs and these could be patched to the two different data acquisition systems. If appropriate, an extra set of Silena ADC's should be located, to incorporate the silicon array signals into DEMON through their CAMAC system. $\boxed{\text{NAO,MF}}$

It would be useful if SUNsort running on a separate SUN could be used to take the ethernet data stream from DEMON and provide on-line analysis capabilities. This should be investigated. The system was developed for DEMON by Alain Ninane of Louvain-la-Neuve, but he is not able to be present for the DEMON running (Ninane@fynu.ucl.ac.be). $\boxed{\text{SMS}}$

## 5. Letters of Intent for SPIRAL (WNC,NMC,MF,NAO,JSW only, present)

These Letters need not include very detailed descriptions of experiments, cf. DEMON letter from the last PAC as an example.

**Neutron Letter:**

A Letter describing experiments with neutron detection, based largely around $^{6,8}$He experiments with DEMON, will be submitted. Use DEMON to reconstruct the invariant mass and the n-n angular correlation. This Letter will be closely linked to the Charged Particle Letter, as both will likely use the charged particle array. $\boxed{\text{NAO}}$

**Charged Particle Letter:**

It was agreed that MF, with input from these discussions and NMC, would produce the first draft for the charged particle Letter. $\boxed{\text{MF}}$

The Letter should highlight the first, most promising experiments for SPIRAL in our programme. We should identify noble gas experiments and flag some future beams (O, N, Li, Na ?). Antonio Villari should be contacted to get relevant background.

The Letter should identify the equipment necessary; existing GANIL equipment, what we will provide, any future equipment such as the recoil spectrometer and/or EXOGAM.

The **scientific case** should be supplemented by information about constrains on beam angular divergence and spot size, energy resolution, energy, intensity, timing properties. The rate should be estimated for events of interest.

If we are planning to use kinematics to give mass identification, then the Letter should include a quantitative illustration.

The preparation for the Letter is likely to include collecting the energy level schemes and shell model predictions for He and Ne isotopes and adjacent elements.

The Japanese cluster calculations should assist in estimating $^{6}$He cluster emission probabilities.

Astrophysical interest includes $^{22}$Ne($\alpha$,n); $^{33}$Ar+p; low levels in rp-nuclei, $^{70--73}$Kr are on the rp-process. The EPSRC proposal also mentioned $^{12}$N breakup to $^{11}$C+p.

Halo work will include $^{17}$Ne. The $^{17}$Ne work will include (d,$^{3}$He) to probe the parentage of proton s- and d-wave states. Note that $^{16}$F states, though unbound, are well known. JSW reported that a recent paper by Hansen and Brown predicts halo behaviour in phosphorus etc. Breakup of $^{17}$Ne to $^{15}$O plus two protons: reconstruct the relative angular momentum. NAO: $^{17}$Ne via transfer to $^{16}$Ne$^{*}$ $\rightarrow$2p + $^{14}$O possibly, since $^{16}$Ne is a 2-proton emitter. Two proton pickup on $^{24}$Ne will make $^{22}$O, e.g ($^{12}$C,$^{14}$O).

The kinematics for the halo breakup reactions will determine whether the SPEG/MUST combination or the silicon array will be best. Protons will have about 10 MeV.

The intruder configurations near N=20 will be explored using nucleon or two nucleon transfer reactions. Some are mentioned in the EPSRC proposal. Looking at the SPIRAL beam intensities, some of the most promising are with $^{44}$Ar to make $^{42}$S [($^{12}$C,$^{14}$O), ($^{14}$C,$^{16}$O) or ($^{18}$O,$^{20}$Ne)], $^{43}$Cl [($^{12}$C,$^{13}$N)] or $^{46}$Ar [($^{16}$O,$^{14}$O)], probing near/towards N=28.

Proton halo configurations will be explored by similar methods, measuring the energy of the $s_{1/2}$ level across isotopes.

It might be possible to make halo states in compound reactions such as $^{17}$Ne($^{14}$C,$\alpha$)$^{27}$P (!!).

The cluster structure of neutron rich nuclei could be probed by breakup. For example $^{24}$Ne to $^{16}$O + $^{6}$He. NAO mentioned that $^{10}$Be to $\alpha$+ $^{6}$He and $^{16}$C to $^{10}$Be + $^{6}$He were likely candidates for a 1998 campaign with fragmented beam in LISE.

With $^{8}$He it may be possible to do ($^{8}$He,$\alpha$) on targets of $^{26}$Mg and $^{30}$Si to reach $^{30}$Mg and $^{34}$Si (thinking of compound-evaporation rather than transfer) getting towards N=20. With an $^{22}$O beam these nuclei could be reached with the reactions ($^{12}$C,$\alpha$) and ($^{16}$O,$\alpha$) respectively. Perhaps the most hopeful CN reaction is $^{26}$Ne($^{12}$C,$\alpha$)$^{34}$Si, maybe looking at kinematic coincidences of $\gamma$-decaying states or the difference between $\alpha$-branching for coexisting shapes.

**CsI detectors:**

The detectors from Psionix cost about £1.5K each. There is an argument for increasing the thickness. Delivery time is about 3 months. Resolution is about 160 keV at 5.5 MeV, light collection depends on position in the crystal. Thicknesses to stop $^{6}$He are 20 mm (60 MeV/A) and 15 mm (50 MeV/A); to stop tritons 40 mm (60 MeV/A) and 29 mm (50 MeV/A).

NAO should get a copy of NMC's tests, from the Charissa document files.

$\boxed{\text{WNC}}$