

Decisions from the g-RISING preparation meeting, July 7-8, 2005

minutes: G. Neyens

RISING project coordinator: Hans-Juergen Wollersheim

g-RISING spokesperson: Gerda Neyens

+ co-spokes (!): Gary Simpson, Adam Maj, Juergen Gerl, Dimiter Balabanski, Michael Hass

Participants

Thursday: Adam Maj, Gerda Neyens, Dimiter Balabanski, Micha Hass, Juergen Gerl, Hans-Juergen Wollersheim, Frank Becker, Magda Gorska, Wawrzek Prokopowicz, Ivan Kojouharov, Pieter Doornental, Nik Kurtz, Take Saito, Nami Saito, Nele Vermeulen, Piotr Bednarczyk, Marek Pfutzner, Gabriela Ilie, Hans Geissel

Friday: + Paddy Regan, not: Juergen Gerl, Take and Nami Saito, Nik Kurz, Hans Geissel

Excused: Gary Simpson, Hubert Grawe, Zsolt Podolyak

Agenda:

- introduction
- the FRS and g-factor experimental set-up (several presentations)
- general task list
- detailed task list + deadlines/timetable
- beam time schedule

0. Introduction

Gerda started by mentioning that this g-factor campaign with the RISING detectors at the FRS is possible ONLY IF

- the experts from the RISING team,
- the experts on the FRS tuning and detectors,
- the experts from previous isomer measurements at FRS
- and the experts on g-factor measurements

work ALL TOGETHER !

Another thing (forgot to say this): if somebody makes a mistake (can happen) do not blame the person but try instead to solve the problem! This is the only way a team can function well and be successful!

Finally: all decisions on changes in the set-up or beam tuning, either during preparations or during the experiment itself, need to be discussed with the spokesperson of the experiment prior to taking action!

Several presentations were given, during which we discussed the set-up:

- scintillators and other FRS detectors to be used,
- shielding to be used (lead wall, additional collimator),
- 'trigger validation detector' and 'veto' detector,
- Ge Cluster detectors, use of BGO shields (or not, active or passive, with additional collimation shields + shield for cutting $E\gamma < 100$ keV),
- electronics (VXI and digital will be used in parallel → need good time resolution and calibration on both!), the trigger,
- the magnet

Below a summary of all conclusions, please read carefully if you agree on everything and comment no later than august 12, after that I will make a final report which will be used as a guide for the preparations.

An issue that was discussed largely, are the conditions related to alignment of the implanted fragment beam. This has important implications for the further simulations to be done.

- Choose target/stripper + primary beam such that maximal amount of fragments is produced fully stripped (preferably >99 %, 100% if possible)
- Keep the fragment beam energy about 200 MeV/u to reduce charge-exchange interactions on passing a surface, and this up to the Cu-implantation foil. This will determine the necessary thicknesses of the S4 degrader and the plexiglass degrader glued to the Cu.
- Avoid as much as possible material in the magnet, to reduce scattering from stopping of the beam → reduce plexi to a minimum.
- avoid unnecessary surfaces in beam line (on every surface a probability of charge changes is present), therefore we decided to remove one MUSIC chamber (and use only 1) + put the first multiwire in air (instead of vacuum)
- calculate for every element in the beam line the survival probability of a fully stripped fragment. What we will get at the end as usefull (aligned) fragments, is then a product of all these probability. The other fraction will be not aligned and reduce our observed R(t) signal. This is our biggest worry.

Selection of the proper momentum window for alignment:

- for fragmentation reactions: select full longitudinal distribution (open S2 slits) and do the momentum selection on event-by-event basis using the position sensitivity of the SC21 scintillator
- for fission: select the most right peak in the broad longitudinal momentum distribution of fission fragments: highest yield and should be aligned because only forward emitted fission fragments contribute to this peak. So, for this, very good simulations are needed to tune the FRS accordingly!

Another item that was discussed at length, is whether or not the use of BGO anticompton shields on the Ge-Clusters should help to reduce the background radiation from scattered gamma rays due to all kinds of background from upstream, from inside the magnet, etc.. These shields could be used as passive shields, or they could be activated and their energy and time registered so that later we can apply the compton suppression in off-line (and on-line) analysis to see if indeed it helps.

Our ideas can be summarized as follows:

1. we think that the shields + their extended collimators will help to reduce background radiation in the Ge-clusters when used as passive shields. Paddy is convinced about this, based on their previous isomer experiences! Other people suggest that more material around the Ge will rather induce more background, so they believe we should maybe not put the shields.
2. Use of shields as ACTIVE shields is to be investigated, it is never done in these conditions.

Based on this information, we came to following conclusion:

(A) we want to compare gamma spectra, in equal conditions, from Clusters with and without shield. This we do by putting 4 BGO WITH and 4 without shield (respectively on two sides of magnet).

(B) We want to check if ACTIVE shieldings helps, by registering the BGO energy and time signals, so that we can off-line combine them with the Ge signals and judge on effectiveness. Optimally, this is done for the 4 shields in place, but for a first test we could do it for 2 detectors only.

After the first run, we need to decide if the shields helped, and if they do, we have to put them on all detectors for the next runs. Further, if the compton suppression works, we should also be ready to have all 8 shields active!

1. FRS and g-factor setup for the g-RISING campaign (from S1 to S4)

It was decided that the following elements/detectors will be in the beam line for the g-RISING campaign (starting from upstream to the end of the set-up):

- SEETRAM for measuring the primary beam intensity
- Target (user specific thickness of ^9Be between 1 g/cm^2 and 2 g/cm^2)
- Stripper fixed to the target (Nb, 221 mg/cm^2 or 108 mg/cm^2 depending on the chosen target, see target ladder 1 on <http://www-w2k.gsi.de/kindler/frs/FRS-HTM/CS-PL.htm> for details)
- SC21 scintillator for start of TOF (identification) and determination of momentum event-by-event correlated with the accepted gamma-event in RISING, thickness **3.37 mm**.
- Degradar in S2 (thickness user specific, between 3 and 8 g/cm^2)
- Multiwire MW41 OUTSIDE (!) the vacuum (in air in S4)
- Only one (!) MUSIC chamber for identification and beam tracking MUSIC-TUM41
- Multiwire RISING MW42
- SC41 scintillator for stop of TOF (identification), trigger for start of acquisition (and of R(t) time measurement), **1 mm** thickness (**Nami, specify exact thickness**)
- X-slits (block beam until sure it is well-tuned, not to hit e.g. crystal or Hall probe in our set-up)
- S4 degrader (AlMg3, minimum thickness 48.6 mg/cm^2)
- A lead wall to protect the detectors from up-stream radiation (particles, gamma's)
- A collimator with a hole of 75 mm, to protect the set-up from particles hitting the magnet yoke (yoke in itself can act as collimator but is maybe not thick enough).
- **"Trigger validation detector"**: scintillator to make a coincidence with the trigger signal from SC41, such that only events from SC41 that are also detected in our set-up give a start to the acquisition (to reduce dead time and unnecessary random events with bad ions), thickness preferably **1 mm** (2 mm is acceptable as well).
- User-specific plexiglass degrader (minimum amount to reduce reactions on it, but as much as needed for each specific case to have the ions maximally stripped when implanted in the Cu stopper)
- Cu stopper glued to this plexiglass
- Hall probe for measuring field + sign into the acquisition, on event-by-event basis
- **"Veto detector"**: scintillator to be sure that the beam is stopped in Cu (not beyond) and certainly not in the plexiglass !!!)
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2. Responsibilities for each of these items

It was decided that the following groups will be responsible (at this stage I mention only if GSI or a Partner is taking the lead in the responsibility). It is clear that each of these responsibilities needs in any case a close collaboration between the GSI and Partner experts (note for Adam: I considered Piotr as GSI)!

- | | |
|--|--------------------------------|
| - SEETRAM | GSI |
| - Target/stripper | Partner decides / GSI provides |
| - SC21, thickness 3.37 mm. | GSI |
| - Degradar in S2 | GSI |
| - Multiwire MW41 OUTSIDE the vacuum (in air in S4) | GSI |
| - MUSIC-TUM41 | GSI |
| - Multiwire RISING MW42 | GSI |
| - SC41, thickness 1 mm (specify exactly Nami) | GSI |
| - X-slits | GSI |
| - S4 degrader (AlMg3) | GSI |
| - Lead wall | GSI |
| - Collimator with a hole of 75 mm | Leuven |

- "Trigger validation detector", thickness 1 mm Camerino/Sofia
- Plexiglass degrader Leuven
- Cu stopper glued to this plexiglass Leuven
- Hall probe Leuven
- "Veto detector" scintillator GSI

3. Detailed responsibilities, tasks, ordered by deadline/execusion date !

Task description	Dates	Coordinator = responsible to organize the task	People involved = people working on the task together with the coordinator
Preparation prior to installation in S4			
Electricity + water (check pressure) to be able to test magnet off-line	July	Frank	Karl Heinz Behr
Put pole gat at 9 cm	July	Wawrzek	
Test magnet power supply (new EPROM)	July	Frank	Mirek Zieblinski (contact via Adam) Gabriela Ilie
Provide a Hall Probe for this test	July	Dimiter	Gary Simpson
Put power supply cables, water connection (pressure) in S4	July	Karl-Heinz	Available, connection to magnet will be done by sept. 16
Put 2 serial cables (RS232) between S4 and computer area (for magnet power supply and Leuven Hall probe remote control)	Before sept. 10-th	Ivan	Nele provides info (type of connections)
Make the "Veto detector" + support	July-August	Wawrzek	
Make a "Trigger validation detector" 1 mm plastic, 8x8 cm2: design provide scintillator material build light guides provide PM (field resistant) test with sources installation + test at GSI	by July 30 July August August by Sept. 8th September	Dimiter Dimiter Dimiter Dimiter Dimiter	Wawrzek, Ivan Technician in Sofia Gary Simpson At Sofia ?? Rady ?
Prepare SC41 scintillator (1 mm) with good time resolution (150 ps)	July-August	Nami	
Design a holding structure (PVC) for - 'Trigger validation detector' + light guides + PM (to be mounted in front of the stopper) - plexiglass + Cu stopper - hall probe behind (below center) of stopper (can be 1 or separate holdings, reduce materials)	By aug. 15	Dimiter	
Build these holding structures	25 Aug.- 20 Sept.	Gerda	At Leuven probably
Order Cu foils (purity > 99.99%) If not proper size (8x8 cm ²): cut them If not annealed: anneal them !	July 12 > August 15 September	Gerda Gerda Gerda	Technician in Leuven Chemist in Leuven

Cut several plexiglass degraders (thicknesses 2, 4, 6, 8, 14 mm)	September	Gerda	At Leuven
Check that enough cables are available for 2 active BGO shields (and report for how many it is possible with existing cables). → take the missing cables from Strassbourg	July-August	Ivan	Piotr
IF IN OCTOBER, ACTIVE SHIELDING SEEMS to help, we should be able to install ALL shields as active for the Nov/Dec run !!! → prepare cable holders when, who ??? → install cable holders in S4 when, who ?	July-August	Piotr Juergen please provide input ?	Paddy PhD student
Make Pb-collimator to mount on Yoke (hole 72-74 mm), do first simulations to check the need for such additional collimator	August-sept	Gerda	
Preparation on-site in S4 and computer area			
Move table and magnet into S4 (+ align) Put the Cluster holders in place (8) Mount the lead wall + lead collimator (align)	1-8 sept.	Wawrzek	Technical student GSI Wlodek Kowalski Other ?
Perform a limited field profile measurement (for 7000 Gauss, field at different positions, needed for calibration of our Hall probe field read during run → will determine error on g-factor → NEED GARY'S HALL PROBE FOR THIS, ours is at GANIL till end of September!	6-8 sept	Nele	technical student GSI Gary
Mount BGO shields on one side (4) Mount the long collimators on shields (4) Mount the Cluster detectors (8)	6-15 sept	Ivan	Piotr, Adam Wlodek Kowalski Other ?
Mount all FRS detectors (SEETRAM, SC21, 2 multiwires, MUSIC, SC41) + slits + AlMg3 degrader → need a SC41, 1 mm thickness, with good time resolution (150 ps) !	8-15 sept.	Wawrzek	Frank, Nami
Test and calibrate all FRS detectors (SC21, SC41, 2 multiwires, MUSIC)	15-24 sept	Frank, Nami	At least one person from partners should help, who ?
Read the hall probe field via remote control and put it (value + sign) into two data acquisition buffers (to have magnetic field + sign on event-by-event basis), though not read event-by-event (impossible)	6-15 sept.	Nele writes controlprogram (labview) and brings manual Hall probe	Henning Shaffner, Nik
Provide a PC + card for reading a logic signal from SIS Write program for remote control of our magnet power supply (labview)	mid sept.	Nele	

Provide a SIS gate signal to our magnet remote control PC	By 15 sept.	Frank ?	
Cabling of the Ge-detectors	13-16 sept	Ivan	Piotr, Gabriela
Decide on the trigger	15-18 sept	Gary	Nele, Take, Piotr, Nik, Henning, Juergen, Adam, Dimiter, Hans-Juergen
Tuning the Ge VXI electronics → need very good time resolution + calibrations (for on-line analysis) !	17-30 sept	Piotr	Gary, Gabriela, Radi (> 25 sept) Some others ?
Prepare the trigger logic into acquisition	18-30 sept	Gary	Nele, Piotr, Nik, Henning (Take support if needed)
Prepare the data acquisition	18-30 sept	Nik, Henning, Take	Nele, Piotr, Gary
Tuning the Ge XIA electronics (digital)	24-30 sept	Henning	Gary, Piotr, Mirek
Prepare 1 BGO shield electronics to be used as active shield. Both BGO and Ge data are collected and later the Compton rejection can be done off-line. IF THIS HELPS: should be prepared for all detectors in the nov-dec campaign !	24-30 sept.	Piotr	
Test remote control + magnet current reading + SIS gate control	Sept. 25-30	Nele	Who can help ?
Prepare on-line analysis for R(t) determination (ion-gamma correlation, with momentum selection on SC21, good time calibrations are crucial)	Sept 20-Oct 14	Jurek	Oriana (post-doc at Bruyere le Chatel), Nele, Rady, Lili (PhD Sofia), Gabriela
Make detailed simulations for production and FRS calibrations	August-Sept-Oct.	GSI contact needed here !?	Radi, Gabriela (Mocadi) Marek, Zsolt (?)
Tuning of FRS with ^{124}Sn beam	7-13 Oct	Magda, Pieter, Nami, Frank, Helmut, Hans	Marek, Zsolt (few days later)
Tuning of the FRS with ^{238}U beam	14-17 Oct.	Magda, Frank Pieter, Nami, Helmut, Hans	Marek, Zsolt

4. Beam time schedule

October: fission alignment + g-factors around ^{132}Sn (G. Neyens, G. Simpson)

Friday 7 – Thursday 13: calibration of all the FRS detectors using a ^{124}Sn beam

Friday 14 – Sunday 16: tuning of the selected fragment beam from ^{238}U fission (750 MeV/u)
Setting to decide: ^{135}Te , ^{130}Sn

Note: isomers in all isotopes, try to select as many as possible together, but such that the total rate does not exceed 10.000 ions/s implanted (unlikely anyhow I guess) and with maximum rate for each isotope. This means using a not too thick S2 degrader (between 2-4 g/cm² is probably OK). Important is also that we have a good ion identification in S2, in particular for each isotope we like to have option to perform momentum selection (although this is much more critical for the fragmentation runs).

Nov-Dec: 94Pd and 196Po runs (112Sn and 238U fragmentation)

Wednesday 30 nov. – Sunday 4 nov: 196Po (Adam Maj, Juergen Gerl)

Monday 5 nov. – Monday 12 nov.: 94Pd (Dimiter Balabanski, Micha Hass)

Several details for these runs need to be decided yet. We propose to have a meeting for this in early November, after the first campaign.

Who will coordinate that part of the campaign (and organize the meeting / task list / ...) ?