# Minutes of the discussion on experiments with the Neutron Wall at GANIL

HIL, Warszawa, 4 October 2007

The discussion followed presentations on Neutron Wall, experiments performed so far with Neutron Wall at GANIL, as well as on EXOGAM, DIAMANT and VAMOS (see www.slcj.uw.edu.pl/neutrons)

## 1 Oxidation

The problem of the oxidation of the targets was discussed in detail. In the previous NWall campaings at GANIL, experiments which used $^{24}$Mg and $^{40}$Ca targets where heavily affected by the oxidation, which was much more severe than in similar experiments run earlier at Strasbourg and in Legnaro.

One possible source of oxygen is DIAMANT (and its plastics). Barna Nyako will take care of testing DIAMANT with respect to that.

It was indicated that targets become oxidized already in the target loader, before they were moved to the target position. Question was raised if it helps, and if it is possible, to install a new, additional pump.

On the other hand, in the "103Sn" experiment (M.Palacz, J.Nyberg) the amount of oxygen accumulated during some of the runs on the $^{58}$Ni target was significantly lower than in an identical experiment run in 1998 with EUROBALL at Legnaro. This observation is true at least for some of the targets used in this experiment. During the 2006 campaign a collimator was installed in the beam line before EXOGAM. Most likely the installation took place just before the "103Sn" experiment. Marcin Palacz and Gilles de France should verify when exactly the collimator was installed and used, and if it is possible to correlate the presence of the collimator with the target oxidation rate.

## 2 NWall efficiency

The efficiency of Neutron Wall in experiments run in 2005 and 2006 was low due to:

1. wrong (too high) thresholds of the PSD units
2. wrong trigger timing
3. shadowing of some the Neutron Wall detectors:
   - for outside detectors - by (probably) elements of EXOGAM
   - for central detectors - by (probably) flenches in the beam line
4. pentagon detector not installed.

The problems of the thresholds and of the trigger timing were understood and solved before the 2006 campaign. The efficiency achieved after solving these two problems were equal 21%. This could be increased to at least 26% if 3. and 4. are properly addressed too.

Note that the NWall efficiency reported by Andres Gadea for his experiment (middle of the 2005 campaign, $e_n = 25\%$) is not consistent with the numbers obtained from the other experiments.

Jean-Nicolas Sheurer and Johan Nyberg will look into the possibility of installing the pentagon as well as will check if the amount of the material (flenches) in the beam line (downstream of the target, inside NWall) can be reduced. Gilles de France will check in the drawings what the reason is of shadowing outside detectors.

## 3 EXOGAM multiplicity in the trigger

During the "103Sn" experiment an additional trigger problem was observed. Namely, using the trigger condition of 1 neutron and 2 exogam detectors resulted in requiring 1 neutron and 3 exogam detectors. Such a problem was not observed in any other experiment, could not be so far reproduced and understood. This must be checked (using sources for example) as soon as EXOGAM and NWall data acquisition systems can be run together again.

Work on connecting Geant4 simulation of EXOGAM with the simulation of the NWall and on preparing simulation of DIAMANT is in progress (Grzegorz Jaworski, Gilles de France, Marcin Palacz), using the Agata Simulation Code as a framework. This work should be completed soon.

# 4 Ideas for possible new experiments with NWall

The following reactions/experiments were mentioned:

1. $^{36}$Ar + $^{40}$Ca $\rightarrow$ $^{67}$Se + 2an
2. $^{36}$Ar + $^{24}$Mg $\rightarrow$ $^{58}$Zn + 2n
3. $^{36}$Ar + $^{58}$Ni $\rightarrow$ $^{92}$Pd + 2n
4. $^{40}$Ca + $^{58}$Ni $\rightarrow$ $^{96}$Ag + 1p1n
5. light Ba, Cs nuclei, populated for example in the $^{58}$Ni + $^{58}$Ni reaction

Experiments 1. and 2. can only be proposed if the source of oxygen contamination is identified and the rate of the target oxidation is significantly reduced.

It is not clear if the experiments would benefit from using VAMOS in addition to NWall (and DIAMANT), and if it would be reasonable to run such experiments with EXOGAM+VAMOS only. Experiment 4. is perhaps a good case for VAMOS, as the 1p1n reaction channel is difficult to discriminate using NWall and a charged particle detector. In addition, a 0.7 $\mu$s isomer is known in $^{96}$Ag and the possibility to use this isomer for tagging should also be evalauated.

One of the benefits from using VAMOS is that products of reactions on target contaminations could be distinguished from the desirable products. It was mentioned, that this could be as well achieved with RFD (see presentation of Witek Męczyński on Friday, 5 October, in the afternoon), with probably higher efficiency. For fusion evaporation experiments with 2n reaction channels a dedicated charged particle detector could also be used instead of DIAMANT, if such a detector provides significantly higher efficiency, and if it is safer from the point of view of the oxygen contamination.