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	2 <sup>nd</sup> DESIR - HRS workshop (November 17-18, 2011)	Date création 18/11/2011
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## Objective: Minutes of the 2<sup>nd</sup> DESIR-HRS workshop, Bordeaux November 17-18, 2011


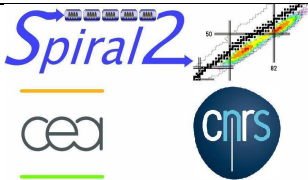
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### Participants:

Thomas Bataille, CENBG, France  
 Bertram Blank, CENBG, France  
 Thierry Chiron, CENBG, France  
 Cary Davids, ANL, USA  
 Franck Delalee, CENBG, France  
 Maurice Duval, GANIL, France  
 Teresa Kurtukian Nieto, CENBG, France  
 David Luney, CSNSM, France  
 Francois Meot, BNL, USA  
 Mathieu Quiclet, GANIL, France  
 Hervé Savajols, GANIL, France  
 Laurent Serani, CENBG, France  
 Marc-Hervé Stodel, GANIL, France  
 Emil Traykov, GANIL, France  
 Franck Varenne, GANIL France (absent)  
 Paul Van den Bergh, K.U. Leuven, Belgium  
 Helmut Weick, GSI, Germany

### Program:

- Welcome and purpose of the workshop (B. Blank)
- The CARIBU Isobar Separator (C. Davids)
- Progress of the SPIRAL2 project (F. Varenne/M. Quiclet)
- DESIR High-resolution separator HRS (T. Kurtukian Nieto)
- Conception of the HRS dipoles (M.-H. Stodel)
- Mechanical design of the HRS (F. Delalee)
- HRS studies with ZGOUBI (F. Meot)
- GICOSY Calculations for the HRS (H. Weick)
- Conclusions and decisions

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### B. Blank:

Welcome to the participants and introduction to the workshop.

### C. Davis: The CARIBU Isobar Separator


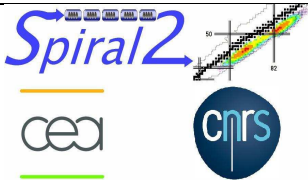
- The Caribu Isobar separator is already installed and in operation at ANL.
- The gas-catcher-ion-source is in operation.
- Mass separated beams have been transported to the low-energy experimental area.
- Mass resolution attained ~4000 without multipole.
- Cary suggests to devote as much time as possible for commissioning.
- Lack of diagnostics on CARIBU. Following this idea, Carry recommends to check this point for DESIR-HRS to operate the system with relative comfort.

### M. Quiclet (replacing F. Varenne): Progress in Spiral2 project and the production building.

- Description of SPIRAL2 facility
- Organization of Spiral2 project.
- Progress of the first and second phase of SPIRAL2. :
  - ✓ First phase equipments are under manufacturing or tests.
  - ✓ Buildings construction has started: first stone ceremony October 17<sup>th</sup>, 2011.
  - ✓ Preliminary design of Phase 2 is completed. All detailed studies to be finished by the end of 2012.
  - ✓ Beginning of construction of equipments and buildings at end of 2013 or beginning of 2014.
- Video of the Spiral2 project

### T. Kurtukian-Nieto: The High Resolution Separator for DESIR

- Global optical design finished.
  - ✓ Expected mass resolution of 1:30000 for a  $1 \pi$  mm.mrad beam as calculated with COSY INFINITY up to 5<sup>th</sup> order.
  - ✓ Resolution drops to 1:20000 taking into account the tolerances for the alignment of the different modules. This is still within the initial specifications
- Mechanical design and integration is on the way.
- Assembly hall ready at CENBG. Ion-source and cooler to be shared with the PIPERADE project.

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- Ordering of dipoles 2012. 400 k€ CPER Basse Normandie available.
- Manufacturing of other elements either at CENBG or by an outside company.
- Installation at CENBG during 2013, tests (transmission, resolution) 2014 and transfer to GANIL 2015.

#### M.-H. Stodel: HRS dipoles

- ✓ Two design of dipoles: one for the DESIR-HRS (5000 gauss) and the other for S3-HRS (7500 gauss). They are basically the same but the iron will be larger in the S3-HRS.
- ✓ The results of design show a good integral of field in the central zone (+-100mm)
- ✓ Curved faces will be an option (additional parts) for the dipoles and build on demand.
- ✓ The weight of one piece is evaluated to 5T
- ✓ Power supplies needed of 21kVA

#### F. Delalee: Mechanical design of the HRS





- ✓ The mechanical design of the HRS and the impact of the “nuclearization” (i.e. working conditions in a high-dose environment) on this design have been described.
- ✓ HRS optical skeleton ready.
- ✓ 3D models available for different modules.

#### F. Meot: HRS studies with ZGOUBI

- ✓ When using TOSCA maps, horizontal and vertical foci at first focus are shifted since MQ1, MQ2 have been used as adjustment variables.
- ✓ Transport matrix at the middle of the multipole features the expected R22, R34, R43 zeroed
- ✓  $\Delta p/p = -53.7$  cm/% so that  $\Delta m/m = 26.9$  cm/% (not so far from the case of matrix calculations with COSY INFINITY where the value is 31 cm/%)
- ✓ Maps with curved entrance and/or exit faces show an effect at the image plane on the second order intrinsic aberration correction
- ✓ The key word “MAP2D” in ZGOUBI has been tested and is operational.

#### H. Weick: GICOSY Error Calculations for the HRS

- ✓ Fringe Fields: We still do not have the real FF distributions but they can be calculated with SIMION or TOSCA. However, the design is good enough because even assuming the largest possible variation of fringe field extensions just requires a small readjustment of quadrupoles + multipole, and all optical properties are restored.

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- ✓ The effective lengths of quadrupoles and dipoles need to be calculated. They will differ from geometrical lengths. This effect is much larger than that coming from the fringe fields.
- ✓ Sextupole Corrections: (X,YY) can be corrected, (X,AA) needs only small retuning with central multipole, (X,BB) cannot be corrected, but it is compensated by symmetry. Curvature  $R = 5.76\text{m}$  on all sides makes overall (X,AA) zero. Influence of short hexapole on final (X,AA): more sensitive inner sides.  $R = 3\text{m}$  would overcorrect the aberration.
- ✓ Misalignments: Shifts in X induce (X,AA) and some (X,BB),(X,XA), to be corrected with sextupoles. Beam angle in Y is uncritical, but angle in X is critical. Central multipole sextupole component allows restoring the optical properties. For large shifts foresee to use steerers.

### General Conclusions:

- ✓ The optical concept has been validated.
- ✓ D. Lunney is going to write a technical report based on the working report of the workshop before the end of the year.
- ✓ GANIL will send the data to have the mechanical design of dipoles for the end of February 2012.
- ✓ The mechanical department of CENBG will check the mechanical constraints/requirements for vacuum chamber-dipoles.
- ✓ GANIL (M. Duval, M.-H. Stodel) are going to estimate the cost of both dipoles (0.5T and 0.75T) for the end of the year 2011.
- ✓ L. Serani and F. Meot are going to finish the calculations using the TOSCA field maps with ZGOUBY beginning of 2012.
- ✓ H. Savajols said S3 has no money for HRS. Belgium will probably finance the S3-HRS.
- ✓ DESIR-HRS dipoles will be ordered beginning of 2012. We will make a common order for DESIR and S3 but leaving the S3-HRS dipoles as an option.
- ✓ S3-HRS will be a copy of the DESIR-HRS most likely without the “nuclearization” constrains.
- ✓ GANIL will give an estimate of the costs for the vacuum system of the HRS.
- ✓ Before Christmas 2011 a complete cost estimate of the HRS will be given.