



The SPIRAL 2 Project

APD Report

January 2005

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FOREWORD

Preamble

First studies at GANIL on the possibility of producing high-intensity secondary beams, with a view to extending the range of the nuclei produced by the present SPIRAL facility to medium-mass nuclei, started as early as 2000 [1]. The proposed method of producing the radioactive ions relies on fission induced by light particles, either with or without an intermediate target to generate high fluxes of neutrons. In order to compare this method with the alternative photofission method, a Preliminary Design Study was recommended by the Scientific Council of GANIL and resulted in the “LINAG Phase I” report. The “LINAG” option was finally chosen in Spring 2002 after a series of reviews commissioned by a Committee comprising experts from several major laboratories.

The facility, which will be able to deliver these radioactive isotope beams (RIBs), was named SPIRAL 2 and constitutes an important intermediate step between existing RIB facilities and the future EURISOL (EUROpean Isotope Separation On-Line) facility, presently being studied by large laboratories in Belgium, Finland, France, Germany, Italy, Sweden, the United Kingdom, and at CERN. In addition, the possible use of the high neutron flux for other purposes has been considered, such as neutron time-of-flight (nToF) measurements with pulsed neutron beams or activation-irradiation of material envisaged for use in future fusion machines, for example.

Following this recommendation, the DSM and IN2P3 institutes decided to launch a two-year detailed design study (APD) which started in November 2002. A collaboration agreement between CEA and CNRS, as well as an agreement between CEA, CNRS and the Region Basse-Normandie were finally signed in September 2003 in which the following specific objectives were defined:

“... ”

- *To update the objectives and scientific arguments of SPIRAL 2 facility within the national and international context during the assumed period of operation,*
- *To define the specifications related to SPIRAL 2 facility, based on the “LINAG Phase I” study,*
- *To list the project content and to clarify the selected technical options by explaining the reasons of these choices and by mentioning the alternative solutions contemplated and the reasons of their rejection,*
- *To provide a sufficiently elaborated and detailed technical report on the chosen solutions, at Detailed Design Study level, ready to start with the call for tenders at the end of this phase,*
- *To summarize the performance to be obtained, compared to the specifications,*
- *To take into account the specific R&D to be carried out on the accelerator, targets, source and experimental devices,*
- *To provide an advanced study of the facility implementation as an extension on the GANIL site,*
- *To estimate the construction costs (investment + personnel) and operation costs,*
- *To propose a project schedule (construction schedule, budget profile of expenses and personnel profile including their professions),*
- *To study methods of financing the project,*
- *To study possible partnerships or collaborations with foreign partners during this Detailed Design Study phase,*
- *To set up a preliminary safety report, within the framework of the European guidelines, as expected by the safety authorities,*

The Detailed Design Study will be sufficiently detailed to minimise the risks and contingencies of components having an impact on the SPIRAL 2 project in terms of performance, costs or delays.

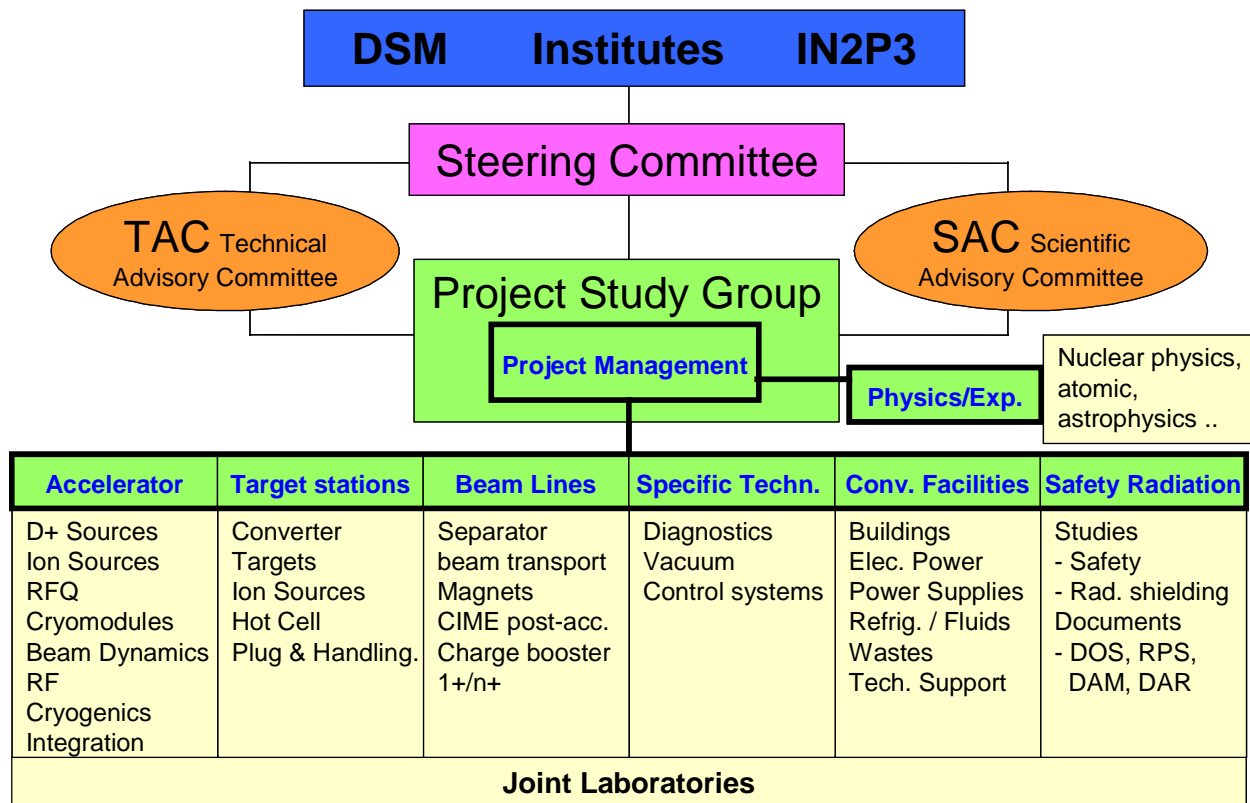
A preliminary report including in particular the expected construction schedule as well as a cost estimate will be presented to these bodies in the Summer of 2003.”

The specifications and the proposed technical options are the result of an optimisation on the physics needs, the technical feasibility and costs. An estimate of the costs and time-schedules is given in Chapter 10.

Since the size of the project is significant – more than 60 FTE people are involved during this 2-year APD phase – a personnel organisation and a quality plan have been established for obvious reasons of efficiency and communication. Collaboration agreements have been signed between the APD SPIRAL 2 Project and the different laboratories of the CEA/DSM and the CNRS/IN2P3, specifying in particular the responsibilities, tasks and allocated personnel.

APD Organisation

A Steering Committee has been established by both DSM and IN2P3 institutes. The Scientific Advisory Committee (SAC) and Technical Advisory Committee (TAC) advise the Steering Committee on all scientific and technical questions, respectively, in particular on matching of the machine performance to requirements demanded by the physics, and on the chosen technical solutions, as well as the expected performance.



In addition to the Project Management and the Physics/Experiments Group, the Project Team is split in six main divisions:

- Accelerator
- Target Source Systems
- Secondary Beam Lines
- Specific Techniques, including Diagnostics, Vacuum and Control Systems
- Conventional Facilities
- Safety and Radiation Protection

Quality Management Policy

In order to meet the objectives defined in the agreement (Convention) between CEA and CNRS, a “Management Plan”, which applies to all participants of the APD SPIRAL 2 project, was implemented by the Project leader [2].

A Quality Management policy was set up in order to coordinate all the actions taken by the project team. To achieve this successfully, a Quality Management unit was set up, to collate and disseminate all documents relating to quality, especially the “particular Plan of Assurance of Quality” (PAQp) [3] for SPIRAL 2, and ad hoc procedures, as well as to make available the utilities necessary for the functioning of the project organisation. This action has been taken in collaboration with those in each section responsible for applying the relevant rules during the project.

The PAQp for the SPIRAL 2 APD project, based on the international norms for quality published by the ISO in their version 2000, has as its object the dissemination of information about the arrangements in place for assuring that all requirements relating to the SPIRAL 2 project are satisfied, as well as those concerning safety and security. It contains or refers to the measures applicable for satisfying the requirements of quality and traceability.

Management, recording and safeguarding of all of the documents are carried out via the Electronic Data Management System (EDMS) tool which the Project Management wished to have set up. The EDMS is a system of data management conceived to store, organise and control all technical data. The installation of EDMS in the project serves a dual purpose: managing documents produced by the project and also a system structured for the group. The EDMS structure was actually built from the definition of tasks and responsibilities and therefore reflects the organisation of the Project Group.

- [1] “High intensity beams at GANIL and future opportunities: LINAG”, G. Auger et al., 2001, GANIL R 01 02.
- [2] “Plan de Management”, EDMS Ref. I-004133.
- [3] “Plan Assurance Qualité particulier”, EDMS Ref. 378417.

List of Committees and Project Team of the SPIRAL 2 APD phase

Steering Committee

D. Goutte	GANIL
D. Guerreau	CNRS/IN2P3
M. Lewitowicz	GANIL
M. Lieuvin	CNRS/IN2P3
M. Zinn-Justin	CEA/DSM
Y. Terrien	CEA/DSM

SAC

W. Gelletly	Chairman	University of Surrey, UK
R. Balian		CEA/SPhT, Saclay, France
P. Bonche		CEA/SPhT, Saclay, France
A. Bracco		INFN, Italy
H. Emling		GSI, Germany
S. Galès		IPN, Orsay, France
M. Harakeh		KVI, Netherlands, Chairman of NuPECC
F. Iachello		University of Yale, USA
K. Langanke		Aarhus, Denmark

TAC

A.C. Mueller	Chairman	IPN, Orsay, France
J.M. Lagniel	Vice-Chairman	CEA/DAM, France
J. Nolen		ANL, USA
G. Bauer		FZJ, Germany
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Project Team (leaders and deputies)

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