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LIST OF ACRONYMS AND ABBREVIATIONS

BINP	Budker Institute of Nuclear Physics
CEA	Le Commissariat à l'Energie Atomique et aux Energies Alternatives
CERN	Centre Européenne pour la Recherche Nucleaire
CNRS	Centre National de la Recherche Scientifique
CODIR	GANIL Comité de Direction
CTA	Cherenkov Telescope Array
DESIR	The low-energy beam line at GANIL-SPIRAL2
EDMS	Electronic Document Management Service, or one of its clones.
ERIC	European Research Infrastructure Consortium
ESA	European Space Agency
ESS	European Spallation Source
EU	The European Union
European XFEL	European x-ray free electron laser
F4E	Fusion for Energy, the European domestic agency of Iter
FAIR	The Facility for Antiproton and Ion Research in Europe GmbH
FTE	Full-time-equivalent : the amount of labour one person would do in one year
FZJ	Forschungszentrum Jülich
GANIL	Grand Accélérateur National d'Ions Lourds
GIE	Contrat Constitutif Groupement d'Intérêt Economique GANIL
GSI	Die Gesellschaft für Schwerionenforschung GmbH
GUEC	GANIL users' executive committee
HIP	Helsinki Institute of Physics
HIPC	Harmonised Index of Consumer Prices (Eurostat)
IKBest4,IKBest5	The 4th and 5th in-kind best practice meetings, in 2018 and 2019 respectively.
IKC	In-kind contribution OR in-kind contract
IKRB	In-kind review board
IP	Intellectual property
NUSTAR	The collaboration for Nuclear Structure, Astrophysics and Reactions at FAIR
SESAME	Synchrotron light for Experimental Science and Applications in the Middle East
SLAC	Stanford linear accelerator
WP	Work package

EXECUTIVE SUMMARY

We propose a bespoke in-kind model for GANIL-SPIRAL2 based on the existing structure and governance of the facility and the sliding scientific scope of the project.

We recommend that GANIL-SPIRAL2 put in place a well-defined process for in-kind calls, approvals and review.

We suggest a review period of six months, and a committee, the in-kind review board (IKRB), to whom proposals and bids should be submitted. The IKRB would make decisions about the worthiness and priority of suggestions based on their scientific value alone.

We recommend that SPIRAL2 adopt a cost book.

Based on the outcome of the IKRB decisions, a second committee, the cost book working group (CBWG) would meet every six months to (re)assign in-kind values and resources, update the cost book, and pass scheduling decisions along to the project management. The CBWG should consider only resources, valorisation and scheduling.

Both the IKRB and the CBWG should report to the existing bodies of GANIL (General Assembly and Comité de Direction, CODIR).

We recommend that the cost book record the fair market value in Euro of each item or group of items as estimated by the CBWG. A cost point and a set of inflationary figures should be fixed in order to keep cost book values comparable over time. We suggest weighting factors to increase the attractiveness of “unattractive” in-kind items. We recommend fixing a conversion rate between FTE and Euro based on the French pay scale, which will allow accounting of material goods as well as services.

We recommend that the GANIL General Assembly agree on an effective start date “SPIRAL2 day zero” or some other criterion by which it can be decided if a previous contribution to GANIL was made to the SPIRAL2 project or not. Past contributions that fit this criterion should be added to the cost book.

We recommend that SPIRAL2 use an electronic document management system like EDMS to track and archive agreements, specifications, drawings, documentation, quality gates, timetabling, delivery, commissioning and decommissioning.

This report is a set of suggestions to the GANIL directorate. Furthermore, we suggest a period of consultation and implementation at GANIL in early 2019, in which the authors will discuss with the Directors and other stakeholders, refine the model and pave the way for establishing the final model at GANIL.

INTRODUCTION

For this report, the authors, who are based at the Facility for Antiproton and Ion Research in Europe (FAIR), spent 18 months comparing in-kind models across Europe. We participated in the Big Science Business Forum 2018, where procurement best practice was discussed by 16 big science facilities in Europe, of which one was FAIR. We initiated administrative exchanges through the fourth international in-kind best practice meeting IKBest4, memoranda of understandings with ESA, CERN and F4E, off-record and on-record

meetings with collaboration partners, and informal resource exchange, such as the wiki <https://wiki.gsi.de/foswiki/bin/view/IKBestX>, as well as a draft data protection declaration between EU and non-EU partners. A monitoring system, based on the one used at F4E, is being pilot-tested at NUSTAR and the Super fragment separator (Super-FRS) at FAIR.

We consulted other big science facilities (CERN, CTA, ESA, ESS, European XFEL, F4E, GANIL), certain of their shareholders (CEA, CNRS, the Rumanian and Danish Ministries of Science and Education, GSI) and certain providers (Pfeiffer Vacuum, BINP, FZJ, HIP and GSI), in consultations with salespeople, technicians and engineers, project managers, ministers, lawyers, research scientists, lobbyists and industrial liaison officers. We did this because we wanted to obtain as broad a picture as possible of the needs of all stakeholders in proposing in-kind models for SPIRAL2. Off-record talks allowed us to learn from the past without putting current relationships at risk.

We considered topics as diverse as export control, state-aid and procurement law, open science and intellectual property, product lifecycle management, data protection, postgraduate education, warranty, quality documentation, market intelligence, technology transfer and costbook review. Of course, these topics do not fall within the remit of WP 2 task 3, but since they overlap onto in-kind contributions, we decided to take them into account at least superficially, to make sure the in-kind models we suggest in this report are compatible with the issues that are most likely to arise as SPIRAL2 progresses.

The main proposals in this report will be discussed and developed during IKBest5 by a hand-picked panel of international experts. The findings will be passed on to the IDEAL coordinator and the Directors of GANIL-SPIRAL2, and do not constitute a part of this deliverable.

SECTION 1: IN-KIND AT GANIL-SPIRAL2: LIST OF INGREDIENTS

How does GANIL work?

GANIL was founded in Caen, France in 1976 as an institute for fundamental research. The laboratory is operated jointly through its legal structure Groupement d'Intérêt Economique (GIE) by the National Institute of Nuclear and Particle Physics (IN2P3) belonging to the National Centre for Scientific Research (CNRS) and the Direction de la Recherche Fondamentale of the Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA). The GIE has been extended to 2046, and remains the current governing document of GANIL-SPIRAL2. It establishes membership and the rights and duties of members. According to this document, the members share contractual rights that define the number of votes they have for the General Assembly of the GIE. On the 14th of December 2015, a new amendment was made to the GIE, which allows for the addition of "scientific partners" via the establishment of bilateral agreements. This same amendment also allows for current members to accept new members via a unanimous vote [1].

It is possible that GANIL-SPIRAL2 will offer two levels of partnership in the future: Scientific Partnerships and Membership. Scientific Partnerships are created via bilateral agreements and the terms of the agreements can be based on individual partner's needs and a principle of fair returns. However, becoming a Member means joining the GIE of GANIL and thus accepting all the privileges and duties of membership. The exact modalities of future Membership and Scientific Partnership are not yet finalised [2], however the recommendations in this report are compatible with current ideas.

Why in kind?

An in-kind contribution (IKC) is a non-cash contribution to a scientific project. It can take the form of IP, personnel, knowledge, hardware, software, services, calculations or raw materials [3]. In the case of big science facilities like GANIL-SPIRAL2, it takes the form of an exchange between academic and scientific institutions. This way, more of our funding stays in academia and public science rather than draining directly into private industry.

Advantages for scientific facilities:

Big science facilities like SPIRAL2 gain access to state-of-the-art technologies and secure long-term scientific partnerships. IKC allow us to comply with state-aid-law, and chose our partners and providers based on their expertise and reputation rather than on the standard EU procurement rules [4] of “best offer”. Many items contributed in kind are not available off the shelf or even bespoke on the open market. Here, technologically or scientifically challenging technologies are developed within an in-kind partnership between equals (GANIL, Member, Provider), rather than within an asymmetric client/supplier relationship.

Advantages for shareholders/members:

Via a principle of fair return (such as ESA’s “juste retour” [5]), shareholders/members provide know-how and gain access to the facility and/or consultation and voting rights on the future of the facility. Member states can tailor their contributions to match their respective national research strategies, for example, the Indian government wishes to make a number of contributions to FAIR that will strengthen the expertise and reputation in India of superconducting technologies [6]. By making contributions in kind instead of in cash, shareholders/members can support their countries and regions by recommending local or national providers and supporting them internally by whatever support scheme is locally in place. Conversely, a cash contribution will be spent on the open EU- or worldwide market, meaning that geographic return is not guaranteed [4]. In the sensitive case of nuclear physics, export control may prevent our sharing IP during the bidding process on the open market.

Advantages for providers:

Providers of IKC gain custom from their national member/shareholder, IP rights, a boost to R&D and a boost to reputation. Small and medium sized enterprises gain a foothold in the big science market. CERN, for example, awards suppliers with a seal that they can use for publicity [7].

SECTION 2: “THE” IN-KIND MODEL

There is no single in-kind model. Each research infrastructure needs to develop its own based on its scientific and strategic needs as well as its legal form and governance [8]. The usual steps involved are:

1. Allocation
Through a mechanism of expression of interest and review, a shareholder/member is allocated an item to provide. The share value or IKC cash equivalent is agreed.
2. Procurement
In this phase, a provider is selected and an in-kind agreement is signed.
3. Monitoring

The progress of the IKC is tracked via milestones and (quality) gates

4. Delivery
FAIR uses Delivery Duty Paid within the EU and Delivery At Place for non-EU suppliers (INCOTERMS 2010). This places no undue import burdens on providers outside the Union [9].
5. Installation and commissioning
How much of the installation and commissioning work is included in the scope of the IKC needs to be well defined in the contract. One model that works well at FAIR is the contractual agreement of a certain number of FTEs to be used for installation and commissioning.
6. Acceptance and transfer of ownership
Acceptance tests and quality gates are needed to check that IKCs comply with scientific and technical specifications [10, 11]. A separate legal acceptance triggers the start of the warranty period and transfers ownership to the Facility.

Our specific recommendations for implementing an in-kind model at GANIL-SPIRAL2 follow.

SECTION 3: BUILDING WITH A SLIDING SCOPE¹

An exemplary infrastructure plan may look as follows [8]:

1. White Paper as statement of political intent
2. Various Green Papers and consultations
3. Clear technical and scientific scope
4. Legal form of the infrastructure
5. Basic procurement strategy
6. Budget and funding decision
7. Technical project planning
8. Piece list
9. Cost book
10. Detailed project and sub-project planning
11. Detailed procurement strategy
12. Specification and design
13. Procurement, delivery, installation, acceptance, commissioning
14. Science!

GANIL-SPIRAL2 does not exactly match this oversimplified pattern (no large infrastructure does), and where certain items, such as the DESIR beamline are at stages 12 and 13, certain sub-projects are at a conceptual stage approximated by step 7. Steps 8 to 10 - if they are indeed to be adopted by SPIRAL2 - are the topic of this report.

Here, we introduce two complementary concepts: the “wedding list” and the creative consultation.

“Wedding list”

A wedding list is a list of presents that a couple compiles and from which their well-wishers can choose what to give the couple on their wedding day. In terms of IKCs, a “wedding list” is a list of parts that we know for

¹ Some of the scope of GANIL-SPIRAL2 is already fixed, however, much is not. We use the phrase “sliding scope” to indicate that the scope is likely to change with time.

certain our facility will need. Potential in-kind providers can consult this list and offer to provide the parts and services that correspond to their portfolio of expertise.

The “wedding list” at FAIR is called the cost book. It is a comprehensive list of all parts needed for the accelerator, as well as their economic value in Euro (price point 2005). The cost book price does not refer to the real costs, but rather indexes the share of the complete infrastructure that one part or set of parts comprises. When costs rise, the complete cost of the accelerator becomes greater but the proportion of those costs coupled to a part does not [10]. The FAIR cost book does not include research and development costs, nor personnel costs. When prices change inhomogeneously, the inhomogeneity is not corrected for in the cost book: this makes certain parts less attractive than others as time progresses and the economy and the state of the art change. As a negative result, certain essential parts have not been claimed by any shareholder and instead they have had to be tendered on the open market at a greater cost, sometimes as much as 250% of the cost book value. The extra costs fall to the host institute; in the case of FAIR, this is GSI.

The ESS cost book does include R&D and personnel costs, but the cost values originally did not correspond directly to shares in the accelerator facility [12]. As costs inevitably rose, this meant that ESS ran out of money and had to effectively add a second cost book to the first, making book keeping a politically fraught matter. This method has worked very well for ESS, however ESS is “too big to fail” (meaning the political sunk costs at the time of the budget overrun were too great to allow the project to fail). This approach does not seem appropriate for a smaller facility like SPIRAL2.

At F4E, the prices listed in the cost book are coupled directly to the Harmonised Index of Consumer Prices (HIPC, Eurostat), the Metal Bulletin and the London Metal Exchange [13]. As the prices of raw materials change on the world markets, the F4E cost book is proportionally updated. For example, if a dipole magnet is to be built of 20% copper, 78% soft iron and 2% other materials and there is a global rise in the cost of copper, 20% of the part’s cost book value can be raised to adjust for this. Of course, this only works for raw materials, not personnel or R&D. Of all the “wedding list” methods currently used in Europe, this is probably the fairest and most transparent, but it is also a huge investment of effort: F4E has one FTE (Mehdi Daval) working on this price indexing. Even so, he only applies the indexing to contracts over 10 million Euro; it has proven uneconomical to put the effort into indexing “small” contracts (“small” means 2 Million Euro at F4E) [13]. Based on Mehdi’s experience, the authors would not recommend this type of indexing for a smaller facility such as SPIRAL2.

Creative consultation

At an earlier stage (up to around stage 6 of the list above), decisions are still open and stakeholders are part of the planning and decision process. At this point, the scope is still open and the creative suggestions and wishes of potential providers are welcome and necessary [14].

How should this creative consultation be managed? How can we explore all possible scientific avenues without exploding the scope? How can we ensure a fair market price is being postulated? How can we satisfy multiple stakeholders? What budgetary and time constraints does the project have as a whole and how can these be respected?

This scope-finding process is usually managed and prioritized by a scientific or machine committee such as GANIL’s Scientific Advisory Committee[2]. The process might take the form of a formal call for proposals and be supported by a series of brainstorming-type discussions and consultation with user groups and other stakeholders.

Sliding Scope

At SPIRAL2 we have a mixture: a sliding scope in which certain items, such as the DESIR beam line, are well defined on a “wedding list” and other parts of the project are open for creative consultation. In fact, the two models can be applied consecutively or iteratively.

In designing a hybrid of the two models, there are several pitfalls we need to avoid. Where part of the scope is fixed, it is easy to imagine that the items involved are of a higher (scientific) priority than the loosely planned items. This need absolutely not be the case, however resources will naturally be assigned to items of known value and provenance at the expense of possibly more important late items. Thus as the scope shifts, priorities must be reassessed and the revised priorities reflected in the schedule and resource allocation.

Like everyone else, scientists like to spend more time and energy on interesting topics than on the humdrum. At FAIR, we experienced this first hand as shareholders clamoured to produce “attractive” items, leaving other items unclaimed and even underspecified. With a sliding scope, this danger is enhanced, because “dull” items will be finalized into the scope later. We propose a weighting mechanism to correct for relative “attractiveness” below.

Hindsight is a useful thing, and late-specified items will benefit from the knowledge we gain in designing and building early-specified items. Where early items came in over budget, it is useful to know this and correct similar late items upwards. However, it is essential that providers of early items are treated fairly and that similar items carry a similar in-kind value.

Where there is the possibility for scope to be enlarged, there is the danger that the project as a whole will simply never finish, or that important interfaces are neglected. The committees supervising scope-finding need to be vigilant.

We recommend that GANIL-SPIRAL2 put in place a well-defined process for calls, approvals and review. A good place to start would be by defining a review period, say every six months, and a committee, the in-kind review board (IKRB), to whom proposals and bids should be submitted. The IKRB would make decisions about the worthiness and priority of suggestions based on their scientific value alone.

Based on the outcome of the IKRB decisions, a second committee, the cost book working group (CBWG) would meet every six months to (re)assign in-kind values and resources, update the “wedding list”, which we will call cost book, and pass scheduling decisions along to the project management. The CBWG should consider only resources, valorisation and scheduling.

Providers would check the cost book after every update and bid to produce items that fit their portfolio. Items not on the cost book can be suggested to the IKRB for the next round.

The key in this recommendation is that the scientific and the valorisation processes be carried out by separate bodies that are separately staffed, i.e., the IKRB and the CBWG. The periodic review keeps the process on track.

The CBWG must be a body whose decisions are respected and approved by all stakeholders. We cannot create a situation in which providers haggle about cost book values. One way to gain this approval is to have all stakeholders represented on the committee. This was the approach that FAIR initially took. A danger of this solution is that parochialism and protectionism may sometimes get the better of the committee and weaken its power or potency. The current model at FAIR uses a CBWG staffed by accelerator experts who

have no actual stake in the FAIR project. This grants them the impartiality they need to make difficult decisions quickly and fairly and to have those decisions respected by all parties.

Both the IKRB and the CBWG should report to the existing bodies of GANIL (General Assembly, CODIR and directorate).

Cost book

What purpose should the SPIRAL2 cost book fulfil, what form should it take and what information should it contain? How will our accountancy work? The cost book is a tool that can help us with some or all of the following tasks:

1. keep a running tally of each country's contribution/share
2. communicate our needs to providers and the marketplace
3. weight and/or group items to increase their attractiveness
4. track FTEs
5. separate investment from running cost contributions

A cost book should not be a part list or a component database. These tasks should be performed by a different set of tools. It also cannot keep track of the total investment value of GANIL-SPIRAL2, because a cost book does not reflect the actual invested costs/FTEs.

We recommend that the cost book record the fair market value in Euro of each item or group of items as estimated by the CBWG. A cost point (say 1st January 2015) and a set of inflationary figures should be fixed in order to keep cost book values comparable over time. "Unattractive" items can be weighted by a factor greater than one to increase their attractiveness [15]. We suggest a factor of 1.2. Particularly "attractive" items, such as those with a high know-how return for the provider, could be weighted by 0.8. This reduces the burden on the host institute, which naturally will be the main provider of unattractive items like concrete.

Not all IKC are material. Design work, modelling or theory can have their cost book value estimated by the CBWG in FTEs rather than Euro. We recommend fixing a conversion rate between FTE and Euro based on the French pay scale. FAIR deliberately excluded FTEs from its cost book. This has often resulted in FAIR bearing the brunt of labour-intensive simulation and design work and has placed lower income countries at a disadvantage. ESS included FTEs at the Swedish rate, and they report satisfaction with this approach [12].

Backdating past contributions

GANIL's Sabrina LeCerf has compiled a comprehensive list of all previous contributions made to GANIL and to SPIRAL2 [16]. We recommend that the GANIL General Assembly agree on an effective start date "SPIRAL2 day zero" or some other criterion by which it can be decided if a previous contribution to GANIL was made to the SPIRAL2 project or not. Past contributions that fit this criterion should be added to the cost book.

SECTION 4: MONITORING IN-KIND CONTRIBUTIONS

No single tool has the bandwidth to track milestones, non-cash payments, deliveries, FTEs and documentation. At the same time, standard tools such as SAP, MS Project, Prince and archiving software already cover much of the ground [17].

Laura Hoestlandt is responsible for contract monitoring at F4E. The most important lesson we learned from her is that some kind of multiple book-keeping is unavoidable for large-scale, dynamic procurement. At F4E, this has the following three ingredients [18]:

1. Contracts, amendments and documentation are handled by a tailored PPA sharepoint (at CERN, FAIR, DESY and European XFEL, this is managed on various clones CERN's EDMS).
2. Cash procurements are managed on SAP (as they are at FAIR).
3. In addition, Laura keeps track of each contract on a database of her own devising, in which she keeps track of hold-points/quality gates/deliverables (these phrases were sometimes used interchangeably), revisions of price, scope or timetable/duration and in which she tabulates the invoices as a running account. This database provides reporting data.

In in-kind procurement, price increases are not relevant, cash equivalency might be. Invoices are also not relevant, but it may still be useful to keep a running account if deductions for late delivery are envisaged, if the host laboratory contributes materially to the IKC, or if the total investment volume is to be tracked. This means that, although standard book keeping via SAP is not relevant (or even appropriate) for monitoring the in-kind process, points 1 and 3 are still necessary for IKC monitoring.

We recommend that SPIRAL2 use EDMS to track and archive agreements, specifications, drawings, documentation, quality gates, timetabling, delivery, commissioning and decommissioning.² EDMS and its clones are already used by CERN, SESAME, SLAC, Brookhaven national Laboratory, ESS, DESY, European XFEL and FAIR. Its track record is therefore proven. Even in the case of in-kind partners delivering turn-key equipment, without the design and approval of SPIRAL2, a reliable documentation and drawing archive is still needed. EDMS provides just this, and it is free [17, 19].

For the monitoring tasks outlined in point 3, the authors are undertaking trials. Our most important recommendation here is that the monitoring process must match the person feeding and updating it very well. At F4E, one FTE is needed to keep on top of the contract monitoring, with a contractual volume of 6.6 billion Euro, price point 2008. The person running the monitoring also designed the method. We ran F4E's excel book-keeping as-is as a trial at FAIR, on 0.05 FTE (for a small subset of the FAIR contractual volume 2 billion Euro, price point 2005). The trial showed that FAIR needed a different method or more FTE (or both).

GSI's Alexander Herlert has written a tool that draws its information from EDMS and Microsoft Project and has it running for the NUSTAR collaboration (contractual volume 9 million Euro, price point 2012). In January 2019, we will extend the trial to FAIR's Super-FRS. The authors will pass on the results of this trial to the IDEAL coordinator and the GANIL directorate at the end of the first quarter of 2019. After the trial, the source code will be shared on a creative commons licence.

² EDMS is hosted by CERN. Measures need to be put in place to ensure compliance with EU data protection and export control.

At the ESS in Lund, Miloš Davidovic and his colleagues have also developed a bespoke system for IKC monitoring. They have been pilot testing their system since the beginning of 2018, and their decision to share it (either licenced or free) depends on IP decisions to be made at directorate level [20].

We recommend that the monitoring tool adopted by SPIRAL2, whatever it be, be as simple and user friendly as possible. It can be a series of Excel spreadsheets, as at F4E, or a specialist tool such as the one being tested at FAIR and ESS. We recommend it be made open source. Although a type of double bookkeeping, the experience of FAIR and F4E has shown that such a tool is necessary to perform plausibility checks and reporting.

SECTION 5: LESSONS LEARNED

In no particular order, here are some lessons the authors have learned either from experience or have collated from various informal discussions. We have agreed to not disclose our sources.

1. Legal form

CERN and ESA are international bodies. They have written their own set of procurement rules and they don't need to abide by the EU procurement directive. ESS is an ERIC. This also allows great freedom in determining procurement rules. FAIR is a limited liability company (GmbH), and German law applies. In the experience of our correspondents, it is worth thinking very carefully about the legal form of a scientific facility because of the various degrees of autonomy those forms provide.

2. Track cost book revisions

As the cost book is revised, it is essential that all changes can be traced in both directions. Failing to do so makes it impossible to differentiate between cost-driven and scope-driven changes.

3. Include warranty as a (payment) milestone

Certain funding agencies will only earmark money for the warranty period if it is coupled to a (payment) milestone. Without earmarking, providers are not reimbursed for warranty actions by their funding agency, legal battles ensue.

4. Cable databank

We recommend that it is clear which cables are the responsibilities on in-kind providers and which belong to the host lab. This is true of all interface items, but the high price of copper makes cabling a particularly thorny topic. In terms of cable standardization, the earlier the cable data bank is drafted, the better.

5. Intellectual property

Another potential for strife is the sharing of background and foreground. Background is the intellectual property that an institution or company already has. Foreground is knowledge that is developed during the realization of a project (in this case, during the realization of the IKC). We recommend the sharing of background based on need-to-know only. We recommend that GANIL secure inexclusive rights to the foreground of providers.

CONCLUSION

We propose a bespoke in-kind model for GANIL-SPIRAL2 based on the existing structure and governance of the facility and the sliding scientific scope of the project.

We make a trade-off between the competing needs of GANIL-SPIRAL2 to be a fixed-term project that comes in on budget whilst allowing the creative input of stakeholders. We discuss two process concepts, the “wedding list” (which we dub the cost book) and the “Creative Consultation”. We suggest structures and processes to align the two and to keep track of the sliding scope (section 3).

We present a sketch of the current organisational structure of GANIL-SPIRAL2 and propose two further committees who will have a consultative or even decision-making role in the assignment of in-kind contributions (IKC) at GANIL-SPIRAL2. These committees are (1) the in-kind review board (IKRB), which makes scientific and technical decisions about which items belong to the scope of SPIRAL2; and (2) the cost book working group (CBWG), which makes decisions about resources, valorisation and scheduling and updates the cost book. Both committees should report to the GANIL governing bodies (section 3).

With these structures in place, we explore the advantages and pitfalls of in-kind contributions (IKCs) and present an abstracted life cycle of IKCs (section 2). We explore existing tools for the monitoring of IKCs and suggest that the results of a current pilot study be considered in developing such a tool for GANIL-SPIRAL2 (section 4).

We compile a list of lessons learned at other big science facilities (CERN, European XFEL, ESS, ESA, FAIR) and make suggestions to avoid common pitfalls (section 5)

This report is a set of suggestions to the GANIL directorate. We suggest a period of consultation and implementation at GANIL in early 2019, in which the authors will discuss with stakeholders, refine the model and pave the way for establishing the final model at GANIL.

ANNEX

Example of a bilateral agreement used at FAIR that could be adapted for GANIL-SPIRAL2 (Annex 1). The scientific contribution would be specified in an implementing agreement.

CO-OPERATION AGREEMENT

BETWEEN

XXX

"PARTNER"

AND

XXX

"COMPANY"

hereinafter collectively referred to as "the Parties",

CONSIDERING that COMPANY is engaged in fundamental research in particle physics and in fields that are essentially related thereto, including but not limited to fields like radiation biology, material science or computing technologies.

CONSIDERING that COMPANY is a XXX

CONSIDERING that XXX

CONSIDERING the purpose of the PARTNER to provide for and to promote, XXX

HAVING REGARD to Article **XXX** of the COMPANY Convention providing that COMPANY may co-operate with other organisations;

CONSIDERING that some of the activities carried out by one Party in pursuing its objectives may be of interest to the other Party, or profit from a contribution by the other Party;

CONSIDERING that it would be in the Parties mutual interest to carry out enhanced co-operation in areas common to both;

DESIRING to establish, in working towards this end, a basis for co-operation which would moreover, optimise the use of their resources;

HAVE AGREED AS FOLLOWS:

ARTICLE 1. PURPOSE

1.1. The purpose of this Agreement is to establish a general framework for mutual co-operation and exchange of information between the Parties, with regard to scientific investigation, research and development, in accordance with their respective tasks and responsibilities.

Such co-operation shall include:

- a) Research in the fields of accelerator science especially **XXX**
- b) Activities in areas of common interest concerning technological/software developments;
- c) Exchange of information concerning the co-ordination of the broad scientific community in areas of common interest.

1.2. The objectives of this Agreement may be achieved by the Parties through such activities as:

- utilisation of the accelerator facilities of COMPANY;
- exchange of information regarding programmes and projects, research results or publications;
- the execution of joint analyses, evolution and development of software tools;

- the co-ordination of research and development programmes and projects and their execution based on shared effort;
- the mutual support to symposia or conferences;
- joint information and public relations activities;
- information on training of personnel and educational programmes.

ARTICLE 2. IMPLEMENTATION OF THE CO-OPERATION

- 2.1. This Agreement shall be implemented through implementing arrangements (which may be called Protocols or Addenda), whenever necessary, relating to specific activities. The arrangements shall contain the tasks and responsibilities of each of the Parties and identify the availability of the resources required to complete the activity with a co-ordinated effort. It shall also describe managerial, technical and operational interfaces between the respective activities and the roles and responsibilities of the Parties.
- 2.2. Each implementing arrangement shall be subject to the provisions of this Agreement and to the rules and procedures of each Party.
- 2.3. Implementation of the co-operation may also be carried out in the form of services or works provided by one Party to the other in accordance with the rules and procedures of the Parties.
- 2.4. Bilateral meetings between the points of contact designated under Article 9 shall be held as often as necessary, and at least once a year, to review progress in the implementation of this Agreement, in particular but not limited to co-operation activities, on-going arrangements and planning of future activities.
- 2.5. Each Party may invite the other to attend meetings relevant to the subjects referred to in Article 1 and the Annex to this Agreement, subject to applicable rules and procedures of the host Party. Relevant documentation shall be communicated to the invited Party and the invited Party shall be entitled to submit contributions to such meetings and participate in the discussions.

ARTICLE 3. FINANCING

Unless otherwise provided in an implementing arrangement, each Party shall bear the cost of its own activities necessary for the implementation of this Agreement, in accordance with its own rules and procedures and without exchange of funds.

ARTICLE 4. EXCHANGE OF INFORMATION AND DATA

- 4.1. The Parties shall inform each other of activities relevant to co-operation on the subjects referred to in Article 1 and the Annex to this Agreement, subject to the rules and procedures of each Party. Relevant documentation shall be communicated to the other Party, to the extent possible, and each Party shall be entitled to submit contributions and participate in discussions.
- 4.2. Each Party shall provide the other Party with all information necessary for the co-operation and the implementation of the activities agreed under this Agreement, subject to its own rules and procedures on exchange of information.
- 4.3. The disclosing Party may decide that disclosure to any person permitted under this Agreement shall be subject to a duty of confidentiality. Disclosure shall extend so far only as may be necessary for the purposes of the Agreement.
- 4.4. The receiving Party shall use the information and data within the limits provided for by the disclosing Party.
- 4.5. Unless otherwise provided in the implementing arrangement, confidentiality obligations shall continue to be in force following expiration or termination of this Agreement.

ARTICLE 5. EXPORT CONTROL

All activities under this Agreement will be conducted in compliance with applicable export control and economic sanction laws and regulations. Each Party shall not knowingly transfer any export controlled item, data, or services, including the transfer to persons employed by, associated with, or under contract to the Party or the Party's Subcontractors, without the authority of an export license, agreement, or applicable exemption or exception. To the extent that information disclosed is export controlled the Parties agree to comply with all regulations regarding its use, disclosure, export, and transfer.

ARTICLE 6. EXCHANGE OF PERSONNEL AND EQUIPMENT

- 6.1. Under this Agreement and as identified in the implementing arrangement, an exchange of personnel maybe undertaken as required to pursue the co-operative activities referred to in Article 1. Subject, and without prejudice, to the rules and regulations governing such personnel's presence at the host Party, including in particular the rules of conduct and safety, such personnel shall remain under the authority of the employing Party and shall accomplish work as defined by the Parties in the implementing arrangements.
- 6.2. The exchange of personnel shall not change their administrative status towards their employer, including but not limited to the latter's obligations concerning the provision of health and social insurance. Each Party shall hold the other Party free and harmless from liability related to the subject matter of this Article in respect of its personnel.
- 6.3. Any equipment or other item contributed by a Party under this Agreement shall conform to the rules and procedures in force at the host Party where it will be installed and operated.

ARTICLE 7. INTELLECTUAL PROPERTY

- 7.1. The disclosure of information, in the widest sense, under this Agreement does not create any proprietary right for the other Party.

- 7.2. Title in intellectual property developed by a Party in the execution of this Agreement shall be vested in that Party, who shall grant the other Party a free, non-exclusive license for the use of such intellectual property in the execution of its scientific programme.
- 7.3. Where intellectual property is developed jointly by the Parties and title is therefore vested in them jointly, they shall grant each other a free, non-exclusive license for the use of such intellectual property in the execution of their scientific programmes.
- 7.4. The providing Party provides no warranty in respect of intellectual property made available by it under this Agreement, and the receiving Party shall hold it free and harmless that any liability arising from its use (including, as the case may be, its partners and contractors) of such intellectual property.
- 7.5. It is agreed that the use of intellectual property for commercial purposes by the receiving party is subject to prior written agreement by the providing Party.

ARTICLE 8. PUBLICATIONS

Always subject to the above obligations on confidentiality and intellectual property:

- 8.1. the Parties, except for activities covered by Article 3 above, shall strive to jointly publish the results of their co-operation as publications open to the general public.
- 8.2. Publications shall acknowledge the collaboration between the Parties, including, whenever appropriate, the experts having taken part in the development of the results covered by the publication.

ARTICLE 9. LIABILITY

- 9.1. Each Party shall bear its own loss and damage in connection with this Agreement and not make claims on the other Party, including with respect to injury, death or damage in respect of its personnel or its contractors and their personnel, except as provided in Articles 6.2, 7.4 and 9.2. It is understood that the foregoing is without prejudice to the settlement of any

claims submitted by one Party's personnel, contractors or their personnel to the other Party on the basis of acts or omissions by the latter.

- 9.2. The responsible Party shall indemnify the other Party for its loss and damage resulting from gross negligence or wilful misconduct by the responsible Party, or a violation by the responsible Party of the rules of conduct and safety in force at the host Party, but not for any consequential loss or damage, such as loss of income or of availability of data or installations.

ARTICLE 10. LIAISON

- 10.1. The Parties shall designate contact persons for the areas of co-operation mentioned in Article 1 and in the Annex to this Agreement.
- 10.2. The points of contact shall in particular co-ordinate actions relating to the implementation of this Agreement and take measures to facilitate further development of co-operative activities. Such points of contact shall be the ordinary channels for the Parties' communication of proposals for co-operation.

ARTICLE 11. PUBLIC RELATIONS

- 11.1. Each Party shall undertake to co-ordinate with the other in advance concerning its own or joint public relations activities related to the subjects covered by this Agreement.
- 11.2. In all relevant media activities, the role of each Party shall be clearly identified and mentioned.

ARTICLE 12. SETTLEMENT OF DISPUTES

Any problems arising during the execution of this contract shall be amicably settled between the Parties. First, the respective project management units of the Parties will have to be involved. In the

event that a solution cannot be reached, the conflict shall be discussed between the Managing Directors of the Company and of the Partner.

ARTICLE 13. AMENDMENTS

This Agreement may be modified by mutual consent. The Party wishing to amend a provision of this Agreement shall notify the other Party in writing. Any amendment shall enter into force when each Party has notified the other in writing of its acceptance of the said amendment in accordance with its own procedure.

ARTICLE 14. ENTRY INTO FORCE AND DURATION

- 14.1. This Agreement shall come into force on the day on which it is signed by the Parties. It shall remain in force for an initial period of five years, and shall thereafter be extended automatically for additional periods of five years, subject to Article 14.2.
- 14.2. Notwithstanding Article 14.1, either Party may terminate this Agreement at any time by giving six months' notice in writing to the other Party, and the Parties may terminate this Agreement jointly at any time.
- 14.3. Except as agreed in writing by the Parties, obligations under this Agreement shall continue to be in force after the expiration or termination of this Agreement, to the extent necessary to secure the implementation of any implementing arrangements concluded pursuant to Article 2 and still effective on the date upon which this Agreement ceases to have effect.