Minutes of the 79th Meeting of the ISOLDE Collaboration Committee

held on June 27th 2017

Present: K. Bharuth-Ram, B. Blank, J. Cederkall, D. Doherty, H. Fynbo, M.J. Garcia-Borge, S. Gilardoni, K. Johnston, Y. Kadi, A. Negret (replacing N. Marginean), A. Nannini, G. Neyens (replacing N. Severijns), M. Pfützner, K. Riisager, L. Schweikhard, S. Siem, O. Tengblad, M. Veselsky (replacing M. Venhart)

Excused: R. Catherall, P. Greenlees, N. Marginean, N. Severijns

Absent: S. Harissopulos

Invited: T. Giles (P.T.), S. Malbrunot (P.T.), B. Marsh (P.T.), J.A. Rodriguez (P.T.), S. Rothe (P.T.), T. Stora (P.T.), L. Willmann (P.T.)

(P.T. = Part Time attendance)

The meeting starts at 09:00 h

1. Introductory remarks

The ISCC chairperson, B. Blank, opens the meeting and welcomes A. Negret, G. Neyens and M. Veselsky who are replacing N. Marginean (Romania), N. Severijns (Belgium) and M. Venhart (Slovakia) respectively.

2. Approval of the Minutes of the last meeting of February 7th, 2017

The minutes from the previous meeting are approved.

3. HIE-ISOLDE beam properties and beam commissioning – *J.A. Rodriguez*

Firstly the committee is reminded that Phase 2A of the HIE-ISOLDE project which is scheduled for 2017 includes the addition of cryomodule CM3 and the HEBT line XT03 as well as the modification of the HEBT XT02 line. J.A. Rodriguez then goes on to confirm the beam properties in 2017, with regard to A/q values and time structure, which were presented at the previous ISCC meeting by E. Fadakis. The committee is reminded that the spokesperson of an experiment should inform the operators in advance if slow extraction is required as, typically, a couple of hours is required for this to be set up. J.A. Rodriguez explains that dedicated beam energy measurements, which will be carried out for each experiment, can now be completed in one hour compared to the four hours it took in 2016. Energy spread optimization may be possible but would need to be requested in advance.

The status of beam commissioning is then briefly summarised. The silicon detector at the XLN2 diagnostic box, which has been used for beam commissioning during 2016 and 2017 has be found to show signs of degraded performance so will probably need replacing after every running period. Time has been spent commissioning low and high level software and both energy and phase scans have been performed. While satisfactory energy scans can be carried out using the count rate measured at

the silicon detector on XT01 after the first dipole magnet the phase scans produced using the same data have shown unexpected behaviour. Hence, the preferred method to phase the cavities is to use the phase scans carried out with the XT01 Faraday cup after the first dipole magnet as the measurements are much faster and less risky than using the silicon detector.

Low energy beam transmission measurements are then presented and the committee told that 80% of the beam can be transported from before the RFQ to the end of XT01. A transmission of about 75% would therefore be expected with the beam elements switched on in 2017.

J.A. Rodriguez then briefly discusses the beam commissioning plan from week 26 to 33 and summarises the details of the first beam to users in 2017 which was approximately 60 hours of ^{22}Ne beam requested by Miniball for testing and calibration in week 25. The performance of REX and the SRF cavities was quite stable but beams with A/q=4.33 will require 40% extra power at REX.

Finally, the status of the Users/Machine interface is summarised. J.A. Rodriguez stresses that operators will only deliver beam to the last diagnostics box of the HEBT line and users are responsible for injection into their experimental set ups.

4. Status and Planning of HIE-ISOLDE phase 2 – *Y. Kadi*

The presentation begins with a summary of the Phase 2 installation work carried out in the tunnel and at XT03 as well as the connection of the ISS magnet to XT02.

The committee is told that five cavities have been tested for cryomodule 4 and all but one have performed well; cavities have been seen to show a 30% increase in performance once inside the cryomodule. The two seamless design cavities (there is an option for a third) have now arrived at CERN and the first is ready to be tested in week 27.

Y. Kadi then summarises the status of the assembly of the cryomodule CM4 for which the same team as for CM1 to CM3 will be used and the same time allowed as for CM3. Problems were encountered with the original solenoid so, as the best performing cavities and solenoid are required for CM4, it was decided to shift the planning by 7 weeks and wait for the spare solenoid 5 which will have coils from Oxford Instruments and its cavity from DanPhysik. Tests performed so far on this solenoid have been positive.

The committee is informed that all the infrastructure is in place for the bunker test of the CM4 at the end of this year but the final decision on whether or not to go ahead with the test will be taken by the project management. The project schedule for 2018 has HIE-ISOLDE physics starting at the beginning of July. However, before this the quadrupole doublet has to be replaced with the final cryomodule and a large amount of cryo-work has to be carried out with the cryo-installation plant only available in February so cancelling the bunker test would gain two weeks if required.

Y. Kadi explains that a full set of spare cavities and a solenoid will be available and a future option would be to have a “hot spare” ready to be installed directly into the machine; the budget for which would be approximately one million Swiss francs.

M.J. Garcia Borge requests that the HIE-ISOLDE website be linked to the ISOLDE website so that project information remains available once it is finished.

5. Beam Developments, Nanolab and target production – *S. Rothe*

The current Target and Ion Source Development (TISD) team is presented as J. Ballof, Y. Martinez, T. Stora, S. Rothe, J. Ramos and the new fellow F. Boix Pamies. The mandate of the team is to provide a large choice of intense and pure radioactive beams as well as the constant development required to keep ISOLDE at the forefront of RIB facilities. Resources such as the ISOLDE workshop and offline test bench as well as beamtime are shared with the ISOLDE physics programme. The plan

to construct a dedicated test stand for ion source development is presented. Initially this would be used for negative ion source development and the investigation of source poisoning and regeneration but future plans include long term performance studies, thermal stress tests and destructive testing.

S. Rothe informs the committee that of the target and ion source developments expected at ISOLDE and presented at the previous ISCC meeting, the STAGISO beam test has been made and the Te yield measurements undertaken using RILIS. It was found that a method needs to be developed to remove the Cs contamination of the Te beam.

The current LIEBE project schedule is presented showing that offline tests are planned to start in August and that the LIEBE target should be ready to go online in mid-November. S. Rothe confirms that, if requested for beam, it is feasible to have the LIEBE target up and running as a workable solution for next year but not as an integrated solution.

The ongoing developments regarding the p2n converter are briefly summarised; the study undertaken in collaboration with TRIUMF will soon be carried out for ISOLDE.

The proposed extension of the target laboratory to provide a Nanolab is presented and the committee informed that the funding for the project is secured. The plan is to connect the ventilation system in 2019. S. Rothe explains that CERN has forbidden the handling of nanomaterials but they have been requested for physics at ISOLDE so an immediate solution is required. Hence, the MWCNT target has been prepared by sealing the nanomaterial in a glove's bag and using the "nano2" class powder technology laboratory at EPFL. However, this is not considered to be a long term solution due to the high level of manpower required.

S. Rothe informs the committee that it is planned to purchase a dedicated oven for CaO production. This will provide precise temperature control as well as temperature uniformity giving higher quality CaO and production time will be reduced to half a day.

The committee is told that the target production schedule is published on a dedicated website cern.ch/isolde-targets and that a new target documentation workflow is being developed. This will be a live document containing photographs and mass scans which will be updated during target use.

When asked by M.J. Garcia Borge, S. Rothe confirms that all the presented projects are realistic with the present level of manpower which is currently shared with MEDICIS.

6. MEDICIS: Status and plans for 2017 – *T. Stora*

The status of the facility is briefly summarised. Installation of the beamline and laboratory are ongoing with commissioning/start-up planned for the end of 2017. This, however, will depend on budget, management and safety clearance. The committee is informed that at the last project review it was concluded that, at present, funding will only allow for the completion of Phase I of the project. This means there will only be one collection point, standard target design and beam instrument box will be used and there will be a reduced level of equipment in the laboratory. Phase II plans to increase the number of collection points to three.

A tentative commissioning and operation planning is presented which shows stable commissioning in September and low isotope activities irradiated at CERN and ILL in October/November. The committee is told that a meeting will soon be organised to clarify the MEDICIS collaboration budget and the start-up planning.

T. Stora informs the committee that, with regards to safety clearance for the construction and operation of the MEDICIS facility, the descriptive and draft demonstrative parts of the safety file have been handed over to the Swiss authorities and comments have been received. The OFSP (Swiss Federal Public Health Office) has requested a visit of the facility at the end of August/ beginning of

September and, depending on the feedback from this visit, the feasibility of the start-up schedule will be reviewed.

T. Stora concludes by presenting the present list of CERN-MEDICIS partners.

S. Gilardoni clarifies that funds for the running of MEDICIS and for Phase II of the project must come from partners outside CERN and that priority has to be given to the operation of Phase I.

7. RILIS operational status and considerations- *B. Marsh*

The committee is told that in 2016 there were 130 days of RILIS operation, corresponding to more than 75% of ISOLDE physics, with 22 separate RILIS runs and 14 different elements. RILIS had a 100% record for on-time setup.

B. Marsh summarises the manpower situation at RILIS in 2017 compared to 2016 with the loss of 3 people with a total of 14 years RILIS experience. However, a new fellow Camilo Buitrago joined the team in March this year and a second fellow, Shane Wilkins, will join in October 2017. It is explained that the student members of the RILIS team have their own projects and commitments in addition to RILIS maintenance, setup and operation and they are not allowed to be placed in a position of sole responsibility for the RILIS installation. Also, students are only allowed to do out-of-hours or shift work if they are an active participant of an experiment. These are some of the reasons why it is proposed to change RILIS operation from on-shift to on-call; the two modes of operation are compared. B. Marsh explains that on-call operation, which has been used for all beams since 2016, will allow more reasonable working conditions for the RILIS team, alleviate scheduling restrictions and increase annual RILIS use. It should also release more time for RILIS development.

B. Marsh goes on to define non-standard RILIS operation which leads to the issue of authorship of publications. The committee decides to postpone the general discussion about this issue until the next ISCC meeting.

The committee hears about the consolidation of RILIS hardware that is taking place to improve reliability. A budget of 280 kCHF from the CERN EN department is being used to replace the dye pump laser, buy a spare BLAZE laser as well as two new TiSa cavities. It is also hoped to maintain the second CERN post so that there will be four experienced RILIS team members in time for the 2018 operating period. S. Gilardoni informs the committee that it is planned to take on a new staff member who will spend a certain percentage of his time working at RILIS.

8. MIRACLS Project – *S. Malbrunot*

Stephan Malbrunot presented the current status of the MIRACLS project which has been funded by the European Research Council; MIRACLS is the acronym for a multi-ion reflection apparatus for collinear laser spectroscopy of radionuclides. MIRACLS will be part of the already extensive laser spectroscopy programme at ISOLDE where hyperfine parameters are measured to a very high precision and which encompasses the COLLAPS, CRIS and in-source programme at RILIS.

For collinear spectroscopy the laser beam is overlapped with the radioactive ion beam from ISOLDE. Photons are detected from laser excited ions and from this a hyperfine structure can be mapped out. This is carried out at beam energies >30kV to avoid Doppler broadening of the beam, permitting high precision laser spectroscopy. Laser spectroscopy is active at most large scale facilities across Europe and the world. Performing these experiments with bunched beams allows a significant improvement in signal over background and allows measurements on ions with yields of $10^3 – 10^4$ ions per second. The typical half-life of ions which can be measured are typically of the order of several ms to seconds. However, the effective time during which these ions are measured is much smaller: of the order of

100ns to a few microseconds. The aim of MIRACLS is to use these exotic ions in a more efficient way. A previous method was to perform laser spectroscopy is a Paul or MOT trap, but the need for laser cooling makes these experiments less generally applicable.

An alternative would be to use a system based on an MR-TOF – such as has been pioneered at ISOLDE by ISOLTRAP. Here the ions are electrostatically trapped between two electrostatic mirrors: the goal of MIRACLS is to extend this approach to collinear laser spectroscopy: the confinement of the ions between the mirrors allows for long observation times and the high voltage (>30kV) allows for high resolution measurements. A simulation indicates that a signal to background improvement is proportional to the square root of the number of revolutions that the ion passes in the trap. This can lead to a considerable improvement in signal of the order of a factor of 40 for light masses and 20 for heavier ions. Among the first science cases to be considered for this technique is ^{34}Mg, at the heart of the island of inversion and also on the current detection limit of COLLAPS, but with MIRACLS a factor of 50 improvement should be achievable. In addition, possible synergies with CRIS are also being explored.

The current status of the project was then shown. A proof of principle experiment is being prepared using the existing MR-TOF from the University of Greifswald. This has a low ion beam energy of 1.3kV and has been adapted for the purposes of laser spectroscopy i.e. laser access has been added as has optical detection in the MR-TOF. Although this low energy beam does not permit high resolution it will be sufficient to demonstrate the proof of the experimental technique. The setup is currently in the offline laboratory in building 508 and the laser table and ion source test stand were shown. Ions excited by collisions can be detected optically and results from this have been demonstrated with a clear difference between trapped and non-trapped ions. The next stage will be to incorporate the laser excitation to show the full experimental proof of principle.

In summary, MIRACLS offers higher sensitivity for collinear laser spectroscopy and will be a novel tool to access previously unmeasurable isotopes and will open a path to certain key nuclides e.g. for nuclear shell evolution and give strong input to theoretical calculations. In addition, there are strong synergies with the plans for the ISOLDE MR-TOF, currently built by Frank Wienholtz. A team of students and a postdoc are part of the project and some of these positions remain open which are expected to be filled soon.

A question was asked whether MIRACLS would require bunched beam, and this is the case. Additional development would then include the possibility of performing collinear and anti-collinear measurements. Impurities in the beam could affect the measurement: a question was asked about what level of impurities can be dealt with. If the ISOLDE MR-TOF is available the beam may be delivered isobarically clean, but if this is not the case then additional simulations will be required: the requirements for laser spectroscopy differ to those for mass spectrometry. For mass measurements the focus is in the time domain, but this is not desirable for laser spectroscopy due to the energy spread involved. E.g. in the ISOLTRAP MR-TOF the energy spread is 60eV while for laser spectroscopy the requirement for laser spectroscopy would be around <1eV.

Normally an MR-TOF is run at relatively low energies – typically ¬5kV – whereas at ISOLDE this device would be at 30kV. MIRACLS will benefit from the expertise and parallel activities in this domain at ISOLDE and also with collaborators at Heidelberg. A first step will be to build the first prototype mirror to check if the voltage can be applied before storage of the ions is considered. In the longer future using negative ions in conjunction with MIRACLS – and perhaps CRIS – would be of considerable interest.

9. Status of the new tape station – *T. Giles*

Tim Giles presented an overview of the current status of the new ISOLDE fast tape station. This is currently installed at LA2. The mechanics are almost ready with some small improvements still needed

such as slight modification of the covers to make them more vacuum tight and the insertion of a window for visual inspection of the tape mechanism.

The detectors are Si photomultipliers, which are pixelated avalanche diodes, which although less performant than good quality photomultipliers, they are more suited for working in vacuum. The electronics have been tested offline but the noise in the ISOLDE hall has required a re-design of the readout system based on transimpedance which is now working well and survives the noise from the ISOLDE hall.

The low-level controls have proved to be an issue. These come from a specialised group at CERN. Although the controls have been built, the software is not complete, the timing/triggering system is not yet installed and the readout counters – from Agilent – are not working as advertised. Finalising this has taken much longer than expected and the section leader of the group is now involved in ensuring that more priority is given to finishing this aspect of the project. The application software has been written although it could not be yet tested with the tape station itself. In addition, software has been developed to enable an automatic proton scan to be carried out. This first takes a decay curve from which timings can be set and then uses these timings to sweep across the target in two stages to determine not only the optimum point of production but also the edges of the target. The software is adaptable to both targets and those with neutron convertors. Furthermore, an automatic software for automatic yield curves has been prepared which should be available to non-specialists and which can also determine the yields over a target's lifetime.

The priority for the immediate future is the finalising of the low-level controls. Once these have been finalised and tested, the aim is to move the tape station to CA0 liberating the space at LA2. A question was asked about the schedule for the above. The services groups are heavily burdened with other projects and without their continuous input, this project cannot be fully tested. Although the amount of work needed is likely to be relatively modest, it requires that resources and manpower are directed towards this project. It is hoped that the final tests could be performed by the end of this year (2017) but this could mean that the installation into CA0 may only take place during LS2.

10. KVI Project – *L. Willmann*

Lorenz Willmann presented an overview of a new Paul trap setup, which could be brought from KVI (Groningen) to ISOLDE for the study of atomic parity violation using the laser cooling of Ra ions. A letter of intent has already been submitted to the forthcoming INTC meeting[1] where it could benefit from the possibility of being able to run during LS2. Lorenz Willmann then detailed the physics basis of the new setup. Atomic parity violation (APV) is the small effect of the weak interaction on the structure of an atomic system, which allows testing of the electroweak part of the Standard Model. The weak mixing (Weinberg) angle – in the form of $\sin^2$(angle) – is a parameter of the standard model, which varies with energy. Its behaviour as a function of the energy scale at which it is probed, can be predicted by the standard model and it has been probed at a wide range of energies. However, at low energy only one measurement is currently done, using atomic Cs. By probing Ra^+ – due to its much larger mass, where the dependence scales at Z^3 – another measurement of atomic parity violation at low energy would be possible and this is the goal of the proposed experiment; the effect on Ra should be 20 times greater than for Ba and 50 times that of Cs.

This experiment requires production and trapping of radioactive ^{225}Ra ions and the TRIμP separator at Groningen has been used in this manner before. ISOLDE would have considerably larger yields than were available at Groningen. Some links to existing experiments at ISOLDE are foreseen, such as the

[1] http://cds.cern.ch/record/2266835?ln=en

CRIS experiment measuring Ra ions. At PSI muon experiments could be carried out to measure the charge radii of Ra ions.

In summary, the proposed experimental setup would allow precision measurements of laser cooled Ra ions which could probe parity violation. Initial work is focussing on Ba^+ ions to develop the experimental setup, and determine atomic properties including line shifts and line shapes. Ra^+ work extends this approach where ISOLDE would give access to a wide variety of isotopes allowing precise measurements on APV and would build on the laser expertise which is available at ISOLDE.

The presentation was followed by questions. The timeframe for the setup was discussed. Although the specifics need to be finalised, the setup would be installed at ISOLDE during LS2. The space required for the setup in the letter of intent is indicated to be 3x5m, but this would be quite a bit smaller at the beginning, and would eventually scale up.

The space of the setup needs to be considered. A final space of 3x5m – which would be effectively permanent – could be difficult to find. LA2 would be a possibility. Although this would reduce the options available for visiting setups, in recent years external groups have increasingly used IDS rather than bring their own detectors to ISOLDE. However, $15m^2$ would occupy both beamlines; some further integration studies will be required to judge where the setup could be located. An alternative mentioned but not discussed in detail was the beamline presently used by NICOLE. This device is in preparation since 2013 after a leak in the cryostat found before the LS1.

The Netherlands is not yet a member of the ISOLDE collaboration. Discussions have been ongoing in conjunction with the TRIμP separator, which is due to come to ISOLDE and will be placed after Miniball. This could constitute a first step towards the Netherlands becoming a member of the ISOLDE collaboration. The committee welcomes the arrival of the TRIμP separator and the new area of physics which the Paul trap would make available at ISOLDE. It is clear that the Dutch group consider membership of the collaboration to be important for the continuation of this project and that the leadership of the project will come via the Dutch groups; the collaborators from existing ISOLDE members would not be expected to be the spokesperson of this experiment.

The committee welcomes the physics which is being proposed. There are many uncertainties regarding space and final integration at ISOLDE along with a detailed timeline. If the submitted letter of intent is endorsed, the group would be encouraged to submit a more detailed full proposal perhaps focusing on the first stages of the experimental setup which would allow the physics case to be judged more closely and secure a more binding commitment from the collaboration for the realisation of this setup.

11. INTC Matters: Backlog of shifts and future strategy – *K. Riisager*

Karsten Riisager gave an update on matters relating to the INTC. The dates for the INTC meetings in 2018 are not yet fixed, but will retain the pattern of 2017: early February, late June and early November.

There has been an enquiry from the AGATA collaboration about bringing AGATA to ISOLDE in 2021. This will need to be discussed in more detail with the Miniball collaboration and a more detailed physics case will need to be presented. This should be presented at a future ISCC, perhaps in 2018.

The backlog of shifts at ISOLDE was then discussed. There are about 1400 shifts outstanding at ISOLDE of which approximately 900 are for HIE-ISOLDE experiments. The backlog for lower energy experiments is quite high, but allows for flexibility in scheduling. Currently experiments are subject to status reports and this will be the mechanism for dealing with the backlog. Experiments, which do not take the beam within three years, will be reviewed by the INTC. Experiments cannot be cancelled by the INTC but recommendations can be made to the CERN research board regarding whether the science case is still valid. New proposals will be accepted in the coming meetings of the INTC on the condition

that they are able to run before LS2 i.e. without major additions in experimental infrastructure, assuming they would be scheduled.

After LS2, when the review of the backlog has been conducted, it would be desirable to avoid such an extensive backlog building up again. One means would be to be more restrictive in the way shifts are approved e.g. limiting the number of shifts, which can be approved in a single meeting as is the case at other facilities. Another would be to be stricter in enforcing an automatic three-year timeout, although this would require permission from the CERN directorate before being implemented. In addition, a summary of experiments which have not requested beam – either for high or low energy – in the past number of years will be prepared, along with a breakdown of the reason and the number of shifts involved.

The open session of the INTC meeting will be on Wednesday June 28th. Eleven proposals for ISOLDE will be presented and the call for letters of intent for running during LS2 has been enthusiastically answered: 26 letters have been received. Initial feedback from the CERN management indicates that resources will be very tight during the shutdown and it is unlikely that many of the letters of intent can expect beam, especially for those requesting accelerated beams or those requiring the use of long-lived activity. In any event, no shifts will be approved for these letters of intent at this time; more concrete decisions can only be made after the research board and LS2 committee are held at the end of September.

Action: ISOLDE physics coordinator to prepare a detailed analysis of recent beam requests based on the discussion above.

12. News from the running period. Schedule plans for the remainder of 2017 – *K. Johnston*

Karl Johnston presented news from the running period currently taking place at ISOLDE. The accelerator schedule for 2017 was shown. A difficult technical stop – which would have greatly affected the first HIE-ISOLDE experiment – has been shifted in time and should now allow enough time for the delivery of the first beam to Miniball. In addition, the possibility of extra time with protons has been raised, perhaps 1-2 additional weeks. This is currently being considered by RP in terms of cooling time for the accelerators for the end of year technical stop.

The current backlog of shifts has already been shown and discussed during the preceding INTC talk: the 900 shifts for HIE-ISOLDE experiments being the main difficulty in terms of scheduling before LS2. A summary of the ISOLDE beam requests for 2017 was then shown. In total 993 shifts were requested by all experiments in 2017 including low and high energy. 59% of these were for HIE-ISOLDE; 27 experiments requesting beam in 2017. The schedule for 2017 until week 36 was then shown. The HIE-ISOLDE experiments will start in week 27. From the low energy running there have been many highlights, but also some difficulties. Excellent runs for IDS, VITO, CRIS and emission channelling have been offset by difficult or cancelled runs for ISOLTRAP, CRIS and COLLAPS. So far about 100 shifts have been delivered. In future – during the annual cold check-out – additional time will be allocated for re-used targets to ensure that they can be used as primary units for physics runs, a leaking unit prevented a run for ISOLTRAP.

Among the highlights from the first weeks of running in 2017 was an excellent run on ^{133}In for IDS using the neutron detector for time of flight measurements. The data indicate clear resonances and the production of exotic ^{133}In was excellent at ~900 ions/uC. A first run on the VITO beamline for 2017 allowed the study of the host material to be selected for the measurement of ^{35}Ar beta decay; the second part of the run will take place at the end of July. CRIS had a successful run on neutron rich In with new data measured on a number of In isotopes. However, the production of neutron rich In was less than seen for the IDS experiment with only ^{131}In visible. An accidental venting of the target at the very

beginning of the run may have compromised the production of the very exotic neutron-rich In. The electron capture of ^{8}B in the excited state of ^{8}Be was the focus of a very successful run at IDS. However, this required the use of a backup target (#513) when it was discovered that the fluorination process for a new unit was unsuccessful. Due to the restrictions for the production of nanomaterials at CERN, this means that the target unit #513 is the only carbon nanotube unit currently available for the production of B beams. Finally, a successful run on the study of Mg in nitride semiconductors enabled the role of fluence dependence to be studied using a ^{27}Mg beam. This builds on a very successful run in 2016, which has already resulted in a Physical Review Letters article, published in January 2017.

The HIE-ISOLDE programme will start in early July. After consideration of the beam requests it has been decided to focus on Coulomb Excitation with the Miniball array at the first beamline in 2017, with a few additional experiments on the third beamline. Transfer experiments with Miniball will be accommodated in 2018. In contrast to previous years, there will be periods of low energy physics interleaved with the HIE-ISOLDE physics experiments. This will allow for the commissioning of the machine to be continued and should improve the efficiency of the machine in total.

From a safety viewpoint there has been a lot of focus on collections at ISOLDE following a monthly dose threshold, which was exceeded during an experiment in 2016. This has led to a re-evaulation of procedures which has proved to be a heavy load on the RP service at CERN. However, initial feedback from the new procedures is positive and it is hoped that experience will improve the working conditions for collections in general.

The ISS magnet has been successfully tested offline in building 190 and was delivered to the ISOLDE hall on 1st March. It will be prepared during the summer and may receive stable beams by the end of the year. The WISARD setup was also successfully tested and has been energised to 9T. It will be ready for stable beams either in late 2017 or early 2018.

13. ISOLDE Membership – *B. Blank*

Bertram Blank summarised the situation regarding membership of the ISOLDE collaboration. Presently the ISOLDE collaboration comprises 16 members: 13[2] pay 60kCHF per year; 2 – Slovakia and South Africa – pay 30kCHF annually; Greece is also among the countries which pays 30kCHF although payment has not recently been received. Of these latter countries, South Africa and Slovakia will continue to pay 30kCHF until 2020 and 2021 respectively whereupon they will revert to the full membership subscription of 60kCHF.

An additional membership category – which applied to Ireland in the past years, where only one scientific group was concerned – allowed for a payment of 10kCHF per year. This was done for five years, but, in 2016, Ireland withdrew from the collaboration, never having signed the memorandum of understanding. A solution is now being sought to concretise the membership situation so that all countries, which have long-standing scientific programmes at ISOLDE, contribute to the ISOLDE collaboration.

Being a member of the ISOLDE collaboration conveys certain rights and responsibilities including the right to be a spokesperson of an experiment but also assumes responsibilities in the area of safety and infrastructure. Non-member countries still have the right to participate in experiments and receive training at ISOLDE but are not able to assume the responsibility of being spokespersons. Although alternative models for a subscription do exist: e.g. the payment of a fixed fee per number of scientists with an obligation to run a certain number of shifts – as is the case at nTOF – this is not applicable to a facility with as diverse an experimental programme as ISOLDE.

[2] The 13 countries are: Belgium, Denmark, Finland, France, Germany, Italy, Norway, Poland, Romania, Spain, Sweden, the United Kingdom and CERN, which for this purpose is considered a country.

It is recognised by the committee that – in spite of considerable efforts among certain countries over the years – securing resources to become a member at the highest levels can be very difficult.

With this in mind, the committee proposes that membership *per institute* may be permitted, which can then be approved by the institute directorate, for which it should be easier to obtain approval. The cost of this would be 10kCHF per institute. This form of membership – already explored at ISOLDE – would have a time limit of 3 years after which full membership of the collaboration would be expected. This institute membership comes with some limitations: the institute would only have observer rights at collaboration meetings and could only be co-spokesperson to experiments; the institute membership would be seen as a commitment to becoming a full member in the near future.

The case of Portugal is especially relevant; the committee recognises the excellent science being pursued by the Portuguese groups at ISOLDE but whose potential membership has been under discussion for many years. The committee urged the institutes to decide either to explore once more the possibility of obtaining full membership of the ISOLDE collaboration or if not possible to join with an institute membership. i.e. paying either 10kCHF per institute per year – but without the full membership benefits – or committing to being a full member of the collaboration – paying 30kCHF initially for 3 years – and thenceforth 60kCHF.

The question was also asked about collaboration countries who find themselves unable to pay the subscription fee or whose number of groups drops over time. This procedure applies to those who do a large part of their research at ISOLDE. In this case institute membership could be considered but, again, with the consequent loss of voting rights.

14. News from the ISOLDE Group & Laboratory portrait – *M.J. Garcia Borge*

Maria Garcia Borge gave some recent news, and reviewed the past five years, from the ISOLDE group. The EURISOL_DF project has been postponed until 2020, by which time more large scale facilities will be operational throughout Europe.

On 10-11 March 2017, a meeting of NuPECC took place at CERN where the Long Range Plan for nuclear physics was discussed. Prior to the meeting a mini-workshop of the hosting Center took place: The NuPECC memebers were welcome by Eckard Elsen: CERN's director of research. Presentations about accelerators, ALICE, COMPASS, ISOLDE,Medical applications at CER, n-ToF and AD were given by Frederick Bordry: director for accelerators and technology, B. Hippolyte, K. Riisager, Th. Stora, Enrico Chiaveri and Michael Doser. It followed by visits to ISOLDE and ALICE by the NuPECC committee. The Long Range Plan was subsequently approved at the Lisbon meeting on 16-17 June and will be officially launched in Brussels in a ceremony on 27th November.

The possibility of bringing AGATA to ISOLDE is being explored by the AGATA steering committee. A white book is being prepared describing the physics which AGATA could pursue from 2021 – 2030. There are five facilities which may be able to host AGATA at this time. In addition to ISOLDE these are GANIL/SPIRAL1/SPIRAL2; GSI/FAIR; JYFL and LNL/SPES. Strong points of HIE-ISOLDE for the AGATA community are the variety and purity of beams and combined with Miniball an increased of detection efficiency.

The ISOLDE laboratory portrait which is to be published in Journal of Physics G under the title: "Focus on exotic beams at ISOLDE: A laboratory Portrait" was then discussed. This is now almost completed, many articles are already available on the IOP website[3], with some accepted manuscripts pending online publication. In addition to the invited contributions, 10 submitted articles have also been received. CERN is now emphasizing the need for open access publication. The cost for open access of the laboratory portrait issue will be 35kCHF and the aim is to have the issue published in a physical form

[3] http://iopscience.iop.org/journal/0954-3899/page/ISOLDE%20laboratory%20portrait

by October 16th. Concerning open access, it will be important to include journals relevant to the nuclear physics community in the SCOAP3 agreement, such as Eur Phys J A and Nuc Phys A.

A summary of payments on the collaboration account was then shown. The payment of the loan for the 3rd beam line will be completed in 2020; the loan reimbursement of 400kCHF will commence in 2019. In spite of the loan commitments the balance of the collaboration is healthy: presently standing at 529, 579 CHF. The outstanding payments for 2016 are Greece and Norway and most countries have already paid their 2017 contribution.

The number of ISOLDE users has been checked. A snapshot from June 23rd shows that 487 external users are active; 711 users have CERN affiliation but this has currently lapsed. In addition, there are 30 in-house users of ISOLDE based at CERN. It is recommended that users register for as long as possible to facilitate the work of Jenny and also to show to CERN management the real size of ISOLDE user community.

An overview of the Associates, Corresponding Associates and staff was shown. The increasing visibility of ISOLDE through the HIE-ISOLDE project, and – with the award of two ERC grants – is reflected in the growing number of associates given to ISOLDE. In 2012 there was one scientific associate (Marek Pfutzner); for 2017, the associates are the following:

- Bertram Blank (until August 2017)
- Angela Bracco (until July 2017)
- Andrei Andreyev (from July 2017 – June 2018)
- Joakim Cederkall (from October 2017 – September 2018)

The corresponding associate until the end of June 2017 is Olof Tengblad. From the two ERC grants ISOLDE is housing Magda Kowalska for the betaDropNMR project and Stephan Ettenbauer for MIRACLS respectively. In addition, the services of two technicians have been secured for ISOLDE which, will be supported via ENSAR2: these are Antonio d'Oliveira and Francois Garnier and they will be able to help with the ISOLDE mechanical workshop and also various tasks supporting physics experiments at ISOLDE. The contact person will be Karl Johnston. The invaluable user support continues to be provided by Jennifer Weterings.

The research fellows in 2017 number four compared to two in 2012:

- Liam Gaffney (October 2016 – September 2019)
- Hanne Heylen (October 2017 – September 2020)
- Kara lynch (January 2015 – December 2017)
- Vladimir Manea (January 2016 – April 2018)

The applied fellows are also four in 2017 compared to two in 2012:

- Akira Miyazaki (May 2017- Dec 2018, SC cavities→ Manchester Contract)
- Lina Pallada (Applied Fellow, June 2017-, ERC)
- Andree Welker (August 2017 -) (Applied Fellow, setting zero-spectrometer)
- Frank Wienholtz (Jan2016 – Dec2018) (Applied Fellow, ERC)

ISOLDE has seen quite a growth in PhD students in the past five years, in 2012 there were two while in 2017 there are seven, which are based at CERN:

- CERN Doctoral Student for IDS:
    - Razvan Lica (Sep2014 – August 2017)
- Doctoral Program with Germany
    - -Andree Werkens (Feb 2015-Jan2018) ISOLTRAP

    - -Jonas Karhein (Nov2017-
- Doctoral student York-CERN (BETADROP):
    - Rob Harding (Jan 2017-)
- Doctoral student Leuven-BETADROP:
    - Fredrik P. Gustafsson (July 2017-)
- Doctoral student MIRACLS:
    - Simon Lechner (Sept 2017)
    - Varvara Lagaki (Sept 2017)

Furthermore, there is an upcoming deadline of October 16 for applications for a CERN doctoral student for 2018.

A general overview of the past five years was then shown. There has been an increase in the in-house group staff for targets and RILIS: Sebastian Rothe and Bruce Marsh respectively. The hands-on courses for RP and electricity have been developed during LS1. The general visibility of ISOLDE throughout CERN has been raised with many articles in the CERN Courier, EP newsletters and on social media e.g. google hangouts. The ISOLDE webpage has also been changed to the new CERN standards and the ISOLDE newsletter has been given an overhaul by Vladimir Manea. In addition, the minutes of the GUI are now linked to the ISOLDE web page. Removing the 2μA limit of protons is under discussion in a more general case, which will be important for the intensity upgrade. Although this can be done for specific cases, a more general investigation of this limit is required for the immediate future.

The courses which have taken place at ISOLDE in the past five years were presented:

- Themes in the physics of Atomic Nuclei given by Rick Casten (July 2012)
- Statistical methods for Nuclear Physics given by Karsten Riisager (March 2013)
- Shell model for non-practitioners given by Frederick Nowacki, Alfredo Poves, C. Sieja (Oct 2013)
- Nuclear Reactions and Nuclear Structure Course given by Wilton Cartford, Alexia DiPietro, and Antonio Moro (April 2014)
- Coulomb excitation school given by M. Zielinska *et al* (January 2016)
- Nuclear astrophysics given by Francois de Oliveira, Gabriel Martinez Pinedo, Olivier Sorlin (May 2017).

Finally, the new building 508 was presented. In 2012 building 507 was in a very poor state and many of the solid state studies with radioactive sources were done in building 275 due to lack of space. An upgrade of this building required the demolition of 115, 507 and 601. This was an intense effort to remove equipment and prepare for the new building. Maria Garcia Borge took the occasion to thank the great effort of the in-house group at that moment which contributed tremendously. Building 508 has now replaced these three older buildings with a total area of 864m^2 housing in the bottom floor offline laboratories for lasers and solid state physics, detector lab and workshop. The first floor houses a visitors space, modern kitchen, data acquisition rooms and a spacious control room. The budget for the building was originally set for 1.35MCHF (excluding the control room). Although there were issues with cooling and ventilation in the past years, the whole building is now conditioned and is considered an immense asset to the ISOLDE facility.

Some future prospects were then shown: at the beginning of July the case of HIE-ISOLDE phase 3 will be presented by Angela Bracco to the CERN directorate; it will be very important for CERN to retain the expertise, which has been built up during the installation of HIE-ISOLDE so that this knowledge is not lost. An automatic liquid nitrogen installation should be installed in the hall during LS2; new instrumentation are on the horizon: ISS, HIE-ISOLDE Fragment Identifier – HiFi, and perhaps AGATA. Looking further into the future studies should be made to profit from the higher intensity

which will be available from LINAC4 along with improvements of the ISOLDE beam dumps, and the option of a new compact storage ring should also be explored.

The chairman thanked Maria Borge on behalf of the collaboration for her immense work throughout the past five years which, encompassed an exciting time but also was the focus of the largest project – HIE-ISOLDE – to take place at ISOLDE. Her contributions and dedication to ISOLDE were recognised. The next ISCC will be the first with Prof Gerda Neyens as the ISOLDE physics leader.

16. Visit of MEDICIS

The committee visited the MEDICIS facility.

17. Dates of the next meeting

The date of the next ISCC meeting is **Tuesday 7th November 2017**. The dates of the meetings in 2018 will be **Tuesday 6th February**, **Tuesday 26th June** and **Tuesday 6th November**.

Meeting ends at 16:30

N.B. The overheads of the above presentations can be found via http://indico.cern.ch/event/ 642427 /