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DRAFT

ISOLDE AND NEUTRON TIME-OF-FLIGHT
EXPERIMENTS COMMITTEE

Minutes of the 58th meeting of the INTC
held on Wednesday and Thursday, February 7 – 8 2018

The chairperson of the INTC (Prof Karsten Riisager) opened the meeting by welcoming the INTC referees who were present and excusing Kristiaan Temst and Arjan Plompen who were unable to attend. The meeting began with the facility reports followed by the presentation of the submitted proposals. Presentations from the open session may be found at the following address: https://indico.cern.ch/event/696585/

1. Facility reports during the open session

ISOLDE technical and physics report (K. Johnston)

Karl Johnston – partly on behalf of Richard Catherall and Sebastian Rothe – presented an overview of the technical work ongoing at ISOLDE during the annual shutdown and target developments along with the initial considerations for the 2018 running period.

Consolidation of the ISOLDE high tension power supplies is currently underway. Power convertors on the GPS and at REX are being replaced and the main 60kV supply and modulator on the HRS is currently being installed which includes the fast recovery system. For 2018 this will require two separate control systems although the original system can be recovered if required. As a negative solution is not yet available, HT1 on GPS remains unchanged to allow for a negative ion run in 2018.

In the ISOLDE front end area a new telescopic camera has been installed which will provide an overall view of the target area from a distance. This will provide feedback on problems if they occur in the front end and will reduce the need for interventions using the telemax robot for many cases. The final design for the new nano-lab for the production of nanostructured actinide targets is almost complete pending final financial and safety considerations. The laboratory is scheduled to begin construction in September 2018. MEDICIS delivered its first radioactive beams in December 2017. During the YETS improvements are being made to the ventilation, the collection box and the transport port. In addition, optimization of the MONTRAC will be carried out to ensure that MEDICIS is fully operational in 2018.

RILIS has been engaged in a number of upgrades including the purchase of a 2nd blaze laser and the replacement of a Ti-Sapphire laser. The annual exchange of the laser windows on both separators is scheduled for week 8. An improvement to the cooling and ventilation system in the RILIS cabin has been postponed to LS2 due to the expected cost. RILIS plans for 2018 include further studies of 2-photon spectroscopy and precise tests of the efficiency of the Sm scheme which was developed in 2017. At the offline lab tests are underway for investigating the new LIST ion source, tests of VADLIS and laser-induced molecular break-up. In addition, high-resistance LIS cavities using SIGRADUR materials will be studied.

A new working group at ISOLDE has been discussing plans for the temporary re-classification of the ISOLDE hall to allow for intense primary beams to be taken to HIE-ISOLDE. This would allow for multi-nucleon transfer reactions to be studied using radioactive beams – instead of stable beams – and would allow new regions to be studied using the unique capabilities of HIE-ISOLDE. A draft plan is

now circulating and will be presented at a forthcoming PS-CSAP committee: upon approval it will be implemented for the physics schedule in 2018.
Among the target developments planned for 2018 are the implementation of the modified LIST geometry in close collaboration with the University of Mainz. Molecular beams will continue to be the focus of much effort in a bid to understand the formation mechanism of SeCO which has caused difficulties in the past number of years. In particular, the use of CF_4 as a carbon source will be examined and a prototype test bench is being designed to allow for more offline control in the production of these beams. The design of the new neutron convertor – in collaboration with TRIUMF – is nearing completion and is expected to be tested in 2018 either at ISOLDE or TRIUMF.

In 2017 a total of 46 experiments were carried out at ISOLDE with 12 of these for HIE-ISOLDE. Among the highlights since the last INTC meeting were the successful runs on ^{59}Cu for nuclear astrophysics, the g-factor measurement of ^{28}Mg using the TDRIV technique and the plunger at Miniball and the successful tests with beam of the ISS at the second beamline in ISOLDE. In all, 427 shifts were delivered at ISOLDE with 394 of these for ISOLDE experiments. In 2018 protons will be available for physics from 9th April. The exclusive low energy period will run until July 9 at which time HIE-ISOLDE will again be available for physics. As in 2017 the plan is to interleave low and high energy runs during the HIE-ISOLDE period as this was found to be an efficient use of the machine. With the installation of the final cryomodule, a dedicated period for transfer reactions is envisaged in 2018 to exploit the accelerator to its full potential. Protons will be delivered until November 12th following which there is intended to be a winter physics programme exploiting long-lived activity until LS2 begins in early December.

HIE-ISOLDE status report (Yacine Kadi)

Yacine Kadi presented an overview of the recent installation work at HIE-ISOLDE. The principal shutdown activities have been the preparations for the installation of CM4 and its installation in the tunnel. Cryo dewar functional tests and maintenance of the compressor station and cold box have been performed and a repair of the Cryo Distribution System has been undertaken by CRIOTEC. In addition, maintenance on the REX RF, XT00 WIC recommissioning, cabling of silicon detectors in XT02 & XT03 cabling have been carried out.

Preparations for the installation of CM4 took place in December and early January and involved the dismounting of the intertank elements and installation of the feet for CM4 and support for intertank XLN6. The transport of the CM4 on January 23rd went according to schedule with the module installed in the HIE-ISOLDE tunnel on the same day. Alignment and connection to the rest of the HIE-ISOLDE accelerator will continue in February. Due to a shortage of manpower there have been delays to the vacuum installation and the cryogenics works. However, there is sufficient margin in the planning that this will not impact the final planning for commissioning of CM4. Essential cryogenics maintenance on the compressor and cold box will be carried out. In addition to preventive maintenance, CRIOTEC will repair the cryogenic distribution system improving the routing of the inner tubing system. These works will be completed to allow for the planned cool down on 23rd March.

Essential REX RF maintenance is also underway. Overall inspection and maintenance of the water system RF room and tunnel has been done. The maintenance of the tuners maintenance and set-up for new tuning ranges has been finished. In addition, the maintenance, cleaning and refurbishment of power supplies and amplifiers has been completed. The IH structure is suspected of having issues with its internal water circuits. The manifolds have to be replaced which will be completed in LS2. During the YETS, a water (20 degree mixed) bypass was installed for easy filter change.

The installation of ISS continues and is now fully integrated into XT02. The installation of HIE-ISOLDE phase 2b is on track and the start of physics with HIE-ISOLDE in 2018 is foreseen for July 9.

Status of nTOF (Daniela Macina)

Daniela Macina presented an overview of nTOF operation in 2017 and plans for 2018. Between September and the end of the proton run in 2017, nTOF carried out 9 experiments and/or tests. The delivery of protons was above the initial request and allowed for the completion of the planned programme.

Among the highlights from 2017, preliminary data from measurements investigating the abundances of $^{77,\,78}$Se and ^{68}Zn were presented. Measured at EAR1 both ^{77}Se(n, γ) and ^{78}Se(n, γ) were successfully measured; the final measurements are planned to be completed in 2018. An improved measurement of 241Am(n, γ) – previously carried out in 2010 at EAR1 – was also carried out in EAR2 which allowed a wider thermal region to be covered along with a greatly improved signal to noise ratio.

Several tests were performed at nTOF. At EAR2 a permanent magnet has been shown to offer many advantages over the sweeping dipole magnet which is installed at EAR1. These include the lack of power supplies required, no external services such as cabling and water and no operational cost. Current design studies suggest that a permanent field of 0.6T will be sufficient for future operation. The current dipole magnet will be replaced with the permanent unit during LS2.

A new safety course has now been implemented at nTOF and is available on sir.cern.ch. This is called "nTOF experimental areas" and will be required from March 1st for all users entering ntof-exp. In addition, at the start of 2018, the radiation protection group will organise a 30 minutes practical course for each team responsible for the installation and operation of an nTOF experiment.

In 2018, nTOF is foreseen to run for 32 weeks for physics. The expected proton request on target will 2.2e19. The draft planning for EAR1 includes a continuation of the ^{68}Zn(n, γ) experiment which will be followed by ^{12}C(n, p); ^{230}Th(n, f) and ^{235}U(n, f). In EAR2 the draft planning features ^{231}Pa(n, f), ^{241}Am(n, f) ^{230}Th(n, f) and ^{53}Mn(n, γ). The remaining parts of the schedule will depend on the outcome of the present meeting.

Documents presented during the open session

1. INTC-P-532 Influence of valence of doping element on local electronic and crystal structure in vanadium oxides: Time-Differential Perturbed Angular Correlations spectroscopy at ISOLDE Artur W Carbonari, (IPEN, Sao Paolo)

2. INTC-P-533 The ^{140}Ce(n, γ)^{141}Ce reaction at nTOF-EAR1: a litmus test for theoretical stellar models. Sergio Cristallo (INFN, Perugia)

3. INTC-P-534 Nuclear moments and transition probabilities in the vicinity of the doubly magic ^{208}Pb by off-line measurements. The case of ^{210}Pb. Joa Ljungvall (University of Paris, Saclay)

4. INTC-P-535 Hyperfine interactions in hydrogenated TiO_2 thin films and powders for photocatalytic reactions Dmitry Zyabkin (T. U. Ilemenau)

5. INTC-P-536 Completing the puzzle around the ^{79}Se s-process branching with the ^{80}Se(n,γ) cross-section measurement César Domingo-Pardo (University of Valencia)

6. INTC-P-537 Commissioning of the i-TED Demonstrator (i-TED2) at CERN n_TOF EAR2 César Domingo-Pardo (University of Valencia)

7. INTC-P-538 γγ-ray Energy Spectra and Multiplicities and Fission Fragment A and Z distributions from the Neutron-induced Fission of ^{239}Pu using STEFF Gavin Smith (University of Manchester)

8. INTC-P-539 First spectroscopy of the r-process nucleus ^{135}Sn Th. Kroll (TU Darmstadt)

9. INTC-P-540 Production of phosphorus-vacancy centres in diamond for optical and spin characterization Ben Green (University of Warwick)

10. INTC-P-541 Measurement of the $^{35}Cl(n,\gamma)$ cross section at n_TOF EAR1 Ignacio Porra (University of Granada)

11. INTC-P-531 Establishing the deformation characteristics of ^{66}Ge George O'Neill (University of the Western Cape, Cape Town)

12. INTC-P-542 Neutron capture on ^{205}Tl: depicting the abundance pattern of lead isotopes in s-process nucleosynthesis Casanovas Hoste (Universitat Politecnica Cataluny)

13. INTC-P-543 Determination of $^{8}Li(n, \gamma)$ cross section via Coulomb dissociation of ^{9}Li Swapan K. Saha (Bose Institute, Kolkata)

14. INTC-P-544 Neutron single-particle states towards ^{78}Ni: $^{80}Ga(d,p)$ ^{81}Ga Eda Sahin (University of Oslo)

15. INTC-P-545 High-precision measurement of the ^{18}Ne superallowed β-decay Q-value Maxime Mougeot (University of Paris, Saclay)

16. INTC-P-546 Collinear resonance ionization spectroscopy of RaF molecules Ruben de Groote (KU Leuven)

17. INTC-P-547 Probing low-lying states in ^{190}Pb via lifetime measurements Janne Pakarinen (University of Jyvaskala)

18. INTC-P-521-ADD-1 Interaction of Na^{+} ions with DNA G-quadruplex structures studied directly with Na beta-NMR spectroscopy Magda Kowalska (CERN)

2. Discussions during closed session: Thursday 8th February 2018

<u>Present:</u>

Karsten Riisager (INTC Chair), Richard Catherall, Marek Pfutzner, Andrea Jungclaus, Dario Vretenar, Daniela Macina, Laurent Tassan Got, Enrico Chiaveri, Yacine Kadi, Thierry Stora, Gerda Neyens, Thomas Prokscha, Alessia di Pietra, Antonio Moro, Iain Moore, Karl Johnston (INTC Secretary).

Excused: Kristiaan Temst and Arjan Plompen

The minutes of the 57th meeting of the INTC were approved without further comment.

Discussion of the Facility reports:

1. ISOLDE technical and physics report

The committee acknowledged the excellent performance of ISOLDE – and in particular HIE-ISOLDE – in 2017. A question was asked about the risks of running with long-lived activity for HIE-ISOLDE. It was reported that long-lived activity can be taken if the physics case is strong, but could have an impact on interventions and maintenance after an experiment. In addition, the planned programme of re-aligning the ISOLDE beamlines in 2019 has been postponed: the risk of not recovering previous settings was judged to be too high and will only be considered following further study.

2. HIE-ISOLDE status report

The committee congratulated the HIE-ISOLDE project team on the successful installation, commissioning and performance of the third cryomodule in 2017 – along with the rest of the accelerator – and also on the progress of the fourth module in 2018.

3. nTOF

The committee congratulated the nTOF collaboration on the performance and physics output of the facility in 2017 along with the impressive planning for the upcoming runs.

Discussion and recommendations for the proposals which were presented during the open session

INTC-P-532 Influence of valence of doping element on local electronic and crystal structure in vanadium oxides: Time-Differential Perturbed Angular Correlations spectroscopy at ISOLDE *(ISOLDE: requested number of shifts: 6)*

This is a resubmission of proposal INTC-P-527, which – although addressing topical problems in the vanadium oxide samples – was not supported by the INTC due to the lack of clarity and overall motivation on how the authors want to achieve the main goals of the proposal. The proposal is now presented in a much better way, satisfactorily addressing the questions raised by INTC in the previous report. Together with the proposed complementary experimental techniques (X-ray diffraction, transmission electron microscopy, scanning electron microscopy, and extended X-ray absorption fine structure) and theoretical DFT calculations, the authors are convincing in their plans that they can provide detailed microscopic information on doping effects on local crystal and electronic structure around the dopant PAC probe atom which allows obtaining new general information about the effects of dopants on an atomic level in this important class of materials.

The committee recommends supporting the proposal and to grant the 6 requested shifts. The INTC cannot make any recommendation about usage of the PAC setups during LS2 – such as the importation of long-lived Hf – since it is unclear what resources will be available to run the PAC setups offline.

The INTC recommends 6 shifts for approval by the research board.

INTC-P-533 The ^{140}Ce(n, γ) ^{141}Ce reaction at nTOF-EAR1: a litmus test for theoretical stellar models. *(nTOF: requested number of protons: 2.9e18)*

The proposal aims at measuring the capture reaction ^{140}Ce(n, γ)^{141}Ce of importance in s-processes. An additional motivation for the proposal concern the fission of importance for reactor design and R&D of $CeBr_3$ and $LaBr_3$ (5% Ce) detectors.

The comparison of stellar model calculations and observations of s-process enriched stars are in agreement for elements belonging to the 2nd s-process peak except for Cerium. Cerium is mostly synthetized in the capture reaction ^{140}Ce(n, γ). This cross-section has been measured previously only in a very limited range of energies, so a measurement in the astrophysical relevant energy region is needed.

For this reason, the proposal is recommended for approval, however due to the small cross-section of this reaction it is recommended to optimise the target thickness in order to achieve the precision required.

The INTC recommends 2.9e18 protons for approval by the research board.

INTC-P-534 Nuclear moments and transition probabilities in the vicinity of the doubly magic ^{208}Pb by off-line measurements. The case of ^{210}Pb *(ISOLDE: requested number of shifts (off-line): 30)*

It is proposed to measure for the first time the magnetic moment of the first 2^+ state in ^{210}Pb using the recoil-in-vacuum (RIV) technique following Coulomb excitation in inverse kinematics. In addition to the g-factor, the transition rates for the (2-0) and (4-2) transitions would be measured with reduced uncertainties when compared to the literature values. Finally, the experiment may also provide information regarding the sign of the quadrupole moment of the 2_1^+ state, $Q(2_1^+)$.

The main motivation for the experiment is the study of the emergence of quadrupole collectivity beyond magic numbers. In the simple picture of ^{210}Pb as consisting of two valence neutrons outside an inert ^{208}Pb core all members of the j^2 configuration are expected to have the same g factor g(j). Therefore any deviation from this expectation, for example a reduced value of $g(2^+)$ as compared to the g-factor of the fully aligned state as observed in other regions of the nuclear chart, can qualitatively be interpreted as collective admixtures to the pure j^2 configuration.

Although the feasibility of the proposed experiment is not questioned by the members of the INTC, the expected impact of the results is not considered strong enough to justify the allocation of such a long beamtime prior to the long shutdown; it could be considered – upon resubmission – after LS2.

The INTC recommends 0 shifts for approval by the research board.

INTC-P-535 Hyperfine interactions in hydrogenated TiO2 thin films and powders for photocatalytic reactions *(ISOLDE: requested number of shifts: 7)*

The authors propose to use TDPAC and eMS to investigate hyperfine interactions of the probe nuclei ^{57}Mn and ^{111}Cd implanted in hydrogenated TiO_2 thin films and powders. Hydrogenated TiO_2 is an interesting material to enhance photocatalytic reactions, where H_2O and CO_2 are converted in chemical reactions at the surface of TiO_2 to CH_4 or H_2. These catalytic reactions are of fundamental importance for future sustainable energy supply. Near-surface defects in hydrogenated TiO_2 seem to play a key role in improving the photocatalytic process. The authors propose to study defect formation phenomena on a local atomic level by means of TDPAC and eMS. A nice feature is that the defects can be controlled to a considerable extent by tuning the film deposition parameters, as well as the post-synthesis plasma treatment. The applicants have a proven track record in controlling these synthesis and processing parameters. By choosing an implantation energy of 30 keV, probe nuclei are stopped in a near-surface region up to a depth of about 15 nm. The authors expect to gain important information which may help to improve the photocatalytic efficiency. As part of the proposal a new Mössbauer spectroscopy setup will be commissioned, which will allow eMS studies under illumination.

Preliminary measurements have indicated that these methods are feasible on this type of samples and this provides confidence for the proposed experiments. The proposal is recommended for approval.

The INTC recommends 7 shifts for approval by the research board.

INTC-P-536 Completing the puzzle around the ^{79}Se s-process branching with the $^{80}Se(n,\gamma)$ cross-section measurement (nTOF: requested protons 3e18)

NOTE: *The discussion of this proposal was extended via e-mail exchange including INTC members not present at the meeting and a final decision was made two weeks after the meeting took place.*

This proposal aims at measuring the $^{80}Se(n,\gamma)$ cross-section of importance in the cold s-process. A measurement of this reaction has been performed previously G. Walter et al., Astron. Astrophys. 167 (1986) 186-199. A detailed investigation of the ^{79}Se branchpoint to improve the accuracy of the analysis of the $^{80}Kr/^{82}Kr$ ratio in terms of parameters for the weak and main s-process made by Walter et al. Astron. Astrophys. 167, 186 (1986). The main aim is to come from improved stellar scenario modelling to a better understanding of the circumstances and relative importance of main and weak s-process. That there are open puzzles is illustrated. ^{80}Kr and ^{82}Kr are shielded from the r-process by ^{80}Se and ^{82}Se so in principle the solar abundances should agree with those by the s-process (Walter et al.). On the other hand there is at least one example where the ratio $^{80}Kr/^{82}Kr$ was found inconsistent with the solar ratio (Ott et al. Nature 332, 700 (1988). Branchpoints are of interest because the competition between beta decay and neutron capture allows a determination of the neutron density.

^{79}Se is special because its first excited state at 95 keV of 3.92 minutes half life has a sizeable beta decay branch of 0.056% (derived from an experimental $\log_{ft}$ value of 4.7(1) Klay and Kaeppeler PRC38, 295 (1988). At temperatures of 30 and 90 keV the excited state has a sizeable population implying effective half lives for the nucleus reduced by a factor 1e4 – 1e5. High neutron densities imply increased ^{80}Se formation and eventually ^{82}Kr, high temperatures high decay to ^{79}Br and eventually ^{80}Kr. Higher temperatures and lower densities are typical of the weak s-process taking place in massive stars with high metallicity. Lower temperatures and higher densities are typical of the main s-process taking place in AGB stars (fig.12 Walter et al.).

The importance and special case of the ^{79}Se branch point and the next – ^{85}Kr – which is not temperature dependent is illustrated in Fig. 2 of Kaeppeler et al. Rev.Mod.Phys.83, 157 (2011) and Fig.11 of Walter et al. This figure also illustrates the importance of the competition between weak and main processes for this mass region. It is therefore an important playground for testing models of nucleosynthesis (modelling of the process in light AGB stars, massive stars, and the assumptions governing the relative contributions).

Clearly the first measurement of interest for n_TOF would be the cross section of ^{79}Se(n,g). The path to this measurement is being investigated both in terms of sample preparation (INTC-I-155, 2014) and measurement method (i-TED2, P-537, this meeting; HYMNS ERC grant 68140. 2016). Both sample and detector are not yet ready and the measurement thus has to wait until after the long shutdown.
Here ^{80}Se(n, γ) is proposed because it is on the path to ^{82}Kr and the present Maxwellian averaged cross section uncertainty is substantially above 5%. (7% according to Walter et al. and the KADONIS database, but the authors of the proposal correctly point out that the data by Walter do not allow a good estimate of the rate as a result of the lower limit or 3.5 keV of the data; this is particularly true for lower temperature stellar scenarios). Walter's uncertainty is definitely higher, certainly for 8-30 keV MACS.

The argument for 5% or better accuracy is given in Kaeppeler et al. It is needed to move beyond the classical approach to the s-process with two empirically modelled and fitted components assuming constant temperature and density to actual models of stars with full temporal and composition modelling and scenarios of end of life and star formation, number of cycles and degree of 'pollution'.
The status of the data is not completely summarized in the proposal. There are 2 additional datasets of interest (Igashira et al, 2011 and Tolstikov et al. 1967) that are considerably less detailed than Walter et al. and not in mutual agreement between 20 and 80 keV, the main region of interest.

The authors do not mention that the evaluated datasets which are shown (EAF, ENDF/B, JEFF, JENDL, TENDL) are based on total cross section measurements which after resonance shape analysis allow a prediction of the capture cross section. It is clear from figure 3 of the proposal that the deduced predictions do not allow a result within 5% and that at least some of the resonances are not agreed between one evaluation and the other. It is also not clear that the energy average matches the Walter et al. energy-averaged data (see paper).

Given the above it seems warranted to attempt a substantial improvement to our knowledge of the ^{80}Se(n,g) cross section in order to allow the authors to make good use of the very difficult measurement of the ^{79}Se(n, γ) cross section in network calculations once the results become available in 4-5 years from now.

The feasibility of the measurement based on 4 g of highly enriched material and 4 C_6D_6 detectors at EAR1 is clearly shown in figure 4 of the proposal. Although the background is substantial, the authors have clearly stated their awareness of this issue and allocate protons to its determination, focussing both on sample-out and background due to neutron scattering.

The improved resolution compared to the Walter experiment is substantial and combined with a proper resonance shape analysis it seems certain that an improved Maxwellian cross section compared to the present status and avoiding the low energy extrapolation problem is within reach. 5% therefore may be achievable. In short, the committee believe that this proposal addresses an important aspect of the interesting branchpoint of ^{79}Se where nature allows a detailed analysis of the weak and main scenarios for the s-process through access to both neutron density and temperature. Combined with more accurate stellar modelling and the anticipated experimental result for the ^{79}Se(n, γ) cross section this measurement will contribute to a more detailed understanding of nucleosynthesis. The committee recommends that the requested 3e18 protons be approved.

The INTC recommends 3e18 protons for approval by the research board.

INTC-P-537 Commissioning of the i-TED Demonstrator (i-TED2) at CERN n_TOF EAR2 (*nTOF: requested protons 1.2e18*)

The authors propose to continue their development of a total energy detector for (n, γ) reactions at neutron time-of-flight facilities with significant background reduction compared to conventional C_6D_6 detectors. A main source of background in C_6D_6 detectors is from scattered neutrons stopping in the environment of the sample where they may generate gammas emitted into the direction of the detectors. In order to suppress this source of background the authors proposed to use a detector which can measure the direction of the gammas, based on Compton scattering in a double layer of a scatter and absorber detector with position sensitive readout. The detectors consist of arrays of $LaCl_3$ crystals and SiPM photosensors which provide the position information. A prototype detector with electronics and data acquisition based on commercial PET systems has been successfully tested in 2017 in EAR-1.

Now the authors want to further advance and to test the performance in EAR-2 with a much higher neutron flux and, as an essential benchmark, they want to measure the ^{56}Fe(n,γ) reaction and to compare the performance of the prototype detector with respect to C_6D_6 detectors. This is an important development for future nTOF experiments, well motivated and designed, and part of an ERC Consolidator grant. The committee recommends to support the proposal.

The INTC recommends 1.2e18 protons for approval by the research board.

INTC-P-538 γ-ray Energy Spectra and Multiplicities and Fission Fragment A and Z distributions from the Neutron-induced Fission of ^{239}Pu using STEFF (*nTOF: requested protons: 6e18*)

For the neutron-induced fission of ^{239}Pu(n,f) it is proposed to measure gamma-ray and fission fragment energies, gamma-ray multiplicity, and fission fragment mass and atomic number distributions, as a function of incident neutron energy.

The principal goal is to obtain better information on prompt gamma-ray emission, which is important for the development of fast reactors. Currently the details of the prompt gamma emission present the major uncertainty in calculating the gamma heating in a reactor (10% of the total energy release in the reactor core is in the form of gamma radiation). The neutron energy range: thermal to 10 MeV. Although the current proposal will unlikely be unable to probe the higher neutron energies, the measurement will lead to a measurement which promises to deliver an order of magnitude improvement in energy range compared to previous measurements. Due to the source size of 30μg cm^{-2}, this requires a relatively long running time. Considering the strength of the physics case, the requested number of protons should be approved. However, it is noted that this is a follow up of the first n_TOF experiment for ^{235}U(n,f) (Ref. [4]), which appears not to have been published yet.

The INTC recommends 6e18 protons for approval by the research board.

INTC-P-539 First spectroscopy of the r-process nucleus ^{135}Sn *(ISOLDE: requested number of shifts: 24)*

The proposal P-539 aims at measuring for the first time the spectroscopy of the ^{135}Sn nucleus using the transfer reaction $^{134}Sn(d,p)^{135}Sn$ at 7.5 MeV/u in inverse kinematics. The region of neutron-rich nuclei beyond ^{132}Sn is extremely interesting, both from the experimental and theoretical point of view. Data are scarce, and calculations require extrapolating effective interactions into regions where parameters cannot be constrained by data. Predicted spectroscopic properties are strongly model-dependent and need experimental verification. This is the case, in particular, for ^{135}Sn in which no excited states have been observed so far. Shell model results obtained using different effective interactions qualitatively agree only for the two lowest excited states.

The physics case is very strong and the experiment is timely. There are experimental limitations that hinder the possibility to obtain spectroscopic information on ^{135}Sn by only detecting the protons. At backward angles, the energy resolution for the detection of protons will be insufficient to resolve the individual states due to the kinematic compression effect; moreover protons coming from the reaction on the beam contaminant ^{134}Sb will partially overlap with the ones of interest. Therefore proton-gamma coincidences are mandatory in order to identify excited states of ^{135}Sn. Elastic scattering should also be measured, this will allow to derive the optical potentials that will constrain better the spectroscopic factors to be deduced for the states of interest.

Although there are technical challenges involved with the proposal, the committee felt that these can be overcome: beam production and purity should be adequate and the spectroscopic goals are feasible if difficult. In addition, the committee recognise the long-standing expertise of the collaboration. Given the strong physics case of the proposal and its potential to profit from the energies uniquely available at HIE-ISOLDE, the proposal is recommended for approval.

The INTC recommends 24 shifts for approval by the research board.

INTC-P-540 Production of phosphorus-vacancy centres in diamond for optical and spin characterization *(ISOLDE: requested number of shifts: 6)*

Point defects in diamond are getting increasing attention due to their possible applications in future quantum communication systems. Although nitrogen-vacancy point defects are appealing for their favourable spin properties, their main drawback is that the emission from nitrogen vacancy point defects is too broad to be useful; therefore the hunt is on for other vacancy pairs that would fulfill the double requirement of narrow optical emission and long spin lifetime. This proposal therefore intends to explore the production of phosphorus-vacancy centres, a system that has not received any attention so far. The production route would be via the implantation of ^{31}Al, which subsequently decays to ^{31}Si and then finally to ^{31}P, which should be a favourable pathway for reliable production of the phosphorous-vacancy and allowing a detailed characterization. This experimental program is in collaboration with Element Six Ltd., an industrial partner with a good reputation for research and development.

In the committee’s opinion this is an interesting proposal with a good scientific motivation and background and touching on a topic which is right into the heart of current (quantum) solid-state physics. The use of radioactive ion beams can deliver unique scientific insight that cannot be easily reached with conventional methods.

The INTC recommends 6 shifts for approval by the research board.

INTC-P-541 Measurement of the $^{35}Cl(n,\gamma)$ cross section at n_TOF EAR1 (*nTOF: requested protons: 2e18*)

In June 2017 the INTC approved proposal P-510 which intends to measure the $^{35}Cl(n,p)^{35}S$ cross section. This cross section is relevant for medical applications and nuclear astrophysics. In the current proposal the authors want to extend their studies to the $^{35}Cl(n,\gamma)$ reaction which is of dual interest, again in medical physics in boron neutron capture therapy (BNCT), and in nuclear fission reactor and nuclear waste studies. In BNCT the present uncertainties in the cross section cause a scatter of estimated doses on healthy brain tissue containing natural Cl of more than 5%, which is above the maximum uncertainty of 5% recommended by ICRU. Better data with lower experimental uncertainty will thus improve such dose estimates and it will lead to more accurate estimates of the amount of ^{36}Cl generated in irradiated fuel.

The committee found the proposal to be well motivated, complementing the previous $^{35}Cl(n,p)^{35}S$ cross section measurement, using the unique capabilities of nTOF to obtain data with better precision over a large energy interval from thermal to ~ MeV. It is recommended to support the proposal with the number of requested protons.

The INTC recommends 2e18 protons for approval by the research board.

INTC-P-531 Establishing the deformation characteristics of ^{66}Ge *(ISOLDE: requested number of shifts: 15)*

The authors propose to study the nucleus ^{66}Ge using Coulomb excitation in inverse kinematics with the MINIBALL spectrometer at HIE-ISOLDE. The main goal is the measurement of the quadrupole moment of the first excited 2^+ state, although also a re-measurement of the transition probability to the second 2^+ state with a better precision as compared to literature is envisaged.

The authors expect that the obtained experimental information would contribute to a better understanding of the shape of this nucleus at low excitation energies. However, neither in the written version of the proposal nor during the oral presentation were any details provided, for example with respect to different theoretical expectations, which would illustrate the impact the envisaged measurement could have. The feasibility of the experiment and the expected precision are not guaranteed. These depend on the quadrupole moment which could be small or close to zero.

Furthermore, it seems that the rich information concerning both systematics and theoretical work presented in the literature have not been fully taken into account in the elaboration of the physics case. Since the authors failed to demonstrate the impact that the results of the proposed experiment would have, the INTC does not recommend the approval of the requested shifts.

The INTC recommends 0 shifts for approval by the research board.

INTC-P-542 Neutron capture on ^{205}Tl: depicting the abundance pattern of lead isotopes in s-process nucleosynthesis (*nTOF: requested protons 3e18*)

The astrophysical main s-process is one of the main sources of heavy elements with A>90 in the Universe. It was shown that the ratio of $^{205}Pb/^{204}Pb$ abundances, measured in meteorites, could provide chronometric information about the time span between the last s-process nucleosynthetic contribution that was able to modify the composition of the proto-solar nebula and the formation of solar system solid bodies (meteoritic solidification). It was also shown that the ratio between the abundance of ^{205}Pb and ^{204}Pb in the stellar envelope changes by -6% to +11% when changing the MACS value of the reaction $^{205}Tl(n,\gamma)$ by +/-33%. Only partial and contradictory results were reported on the cross section of this reaction. It results in different MACS values differing by up to 30%. It is proposed to use the

TOF technique to measure the neutron capture cross section of this reaction over the full energy range of stellar interest and to reduce the uncertainty in the 205Pb/204Pb ratio.

There are two main concerns about this proposal. The first is related to the astrophysical impact. The theoretical astrophysical paper quoted in this proposal (YOK85) is the last one published about this subject. It was published quite a long time ago (1988), it was a simple and rather qualitative model. So, there has been no confirmation of the importance of the subject since this publication. Moreover, there must have been several stars having undergone s-process and having contributed to the solar abundances. There must have been several different time intervals between the last s-process of these stars and the meteoritic solidification.

The second concern is related to the possible impact of the results. There is expected to be a change in the ratio of astrophysical abundances $^{205/204}$Pb by only a few percent (max 18 % uncertainty), which is quite weak. Today, the measured $^{205/204}$Pb ratio is known with a precision of only 22 % (Meteoritics & Planetary Science **53**, Nr 2, 167–186 (2018)).

Despite these concerns, the INTC find the proposal very interesting and recommends 3e18 protons for approval by the research board.

The INTC recommends 3e18 protons for approval by the research board.

INTC-P-543 Determination of ^{8}Li(n, γ) cross section via Coulomb dissociation of ^{9}Li (*ISOLDE: requested number of shifts: 18*)

The proposal aims at determining the ^{8}Li(n,γ) cross-section, of interest for the inhomogeneous Big-Bang scenario, from the Coulomb dissociation of a ^{9}Li beam on a ^{208}Pb target. The motivation and viability of the proposal was found to be hampered by several factors.

The inhomogeneous Big-Bang nucleosynthesis model has faded away in the last decade; the data essentially confirm observationally that no significant departure from the homogeneity or isotropy is required (see F. Iocco *et al.* Physics Reports **472** (2009) 76) and some abundances, for example the predicted ^{7}Li and ^{9}Be abundances, are in strong disagreement with the measured one (e.g see A. Coc *et al.*, Astro. Phys. Journal **402**, (1993) 62).

The estimated breakup cross section quoted in the proposal (10 mb), has been apparently adopted from Ref. [2]. That work corresponds also to the ^{9}Li+^{208}Pb reaction, but a significantly higher energy (28.5 MeV/nucleon). At the proposed energy (7 MeV/nucleon) the breakup cross section is expected to be much smaller. Moreover, the quoted experimental cross section includes both nuclear and Coulomb contributions. The proposal does not provide an estimate of the relative importance of these two contributions or the angular range where the Coulomb contribution is expected to dominate. These estimates could have been reliably obtained, for instance, by means of CDCC calculations.

The proposed experimental technique consists in detecting coincidences between ^{8}Li and neutrons around zero degree. The feasibility of the experiment is hampered by the possibility of detecting and identifying ^{8}Li-n coincidences around 0^0 in the presence of the high counting rate (5×10^6 pps) originated by the beam being stopped in the detector and the high neutron background generated both by the reaction of the ^{9}Li beam with the detector (beam-dump) and the neutrons coming from the radioactive decay of the beam.

Considering the above reasons, the proposal is not recommended for approval.

The INTC recommends 0 shifts for approval by the research board.

INTC-P-544 Neutron single-particle states towards ^{78}Ni: ^{80}Ga(d,p) *(ISOLDE: requested number of shifts: 18)*

The authors propose to study the N=50 nucleus ^{81}Ga populated via the (d,p) transfer reaction in inverse kinematics. The main goal is the determination of the excitation energies of neutron particle-hole states across the N=50 shell gap which would allow a study of the evolution of this gap towards ^{78}Ni.

Although the basic idea behind the proposal at first sight looks interesting, the elaboration of the proposal is too superficial to allow for a serious evaluation of the feasibility of the proposed measurement. For example, the discussion is limited to the $13/2^-$ and $15/2^-$ states although many more states based on the $g_{9/2}^{-1}$ x $d_{5/2}$ particle-hole excitation coupled to the odd proton will be populated in the (d,p) reaction. Furthermore there is good reason to expect also that transfer to the $s_{1/2}$ orbital will occur since this corresponds to l=0 transfer as compared to l=2 to the $d_{5/2}$ and the two orbitals are close in energy (in ^{83}Ge the $s_{1/2}$ state lies only 280(20) keV above the $d_{5/2}$ ground state). The complications due to the population of states belonging to other configurations is not discussed in the proposal just as no mention is made of the expected decay paths of the populated states. Due to the limited energy resolution for the protons, in many cases gamma coincidences will be required in order to fix level energies. Therefore, a consideration of the expected decay patterns is mandatory in order to demonstrate the feasibility of the proposed experiment. Based on the information which has been provided the INTC does not recommend that the proposal be approved.

The INTC recommends 0 shifts for approval by the research board.

INTC-P-545 High-precision measurement of the ^{18}Ne superallowed β-decay Q-value *(ISOLDE: requested number of shifts: 8)*

The proposal aims a high-precision measurement of the ^{18}Ne (T_z= -1) superallowed beta decay with ISOLTRAP. Measurements of the Q_{ec} values, along with half-lives and branching ratios, are the three experimental parameters required for a measurement of the ft (transition rate) value. Combined with a set of theoretical uncertainties, these values form the so called Ft values, which provide a critical test of the CVC hypothesis, are used to set limits for scalar currents (primarily the lightest emitters) and contribute to the most demanding available test of the CKM unitarity. The measurement of the Q_{ec} value, entering to the 5th power in the FT value calculation, has been dramatically improved (both in precision and accuracy) by the advent of Penning traps, and these devices are still actively used in such physics cases.

In the recent 2015 survey by Hardy and Towner, 14 transitions with Ft value uncertainties of less than +/-0.4% are used to determine the world average value. The Q_{ec} values of all 14 have now been measured (in many cases cross-checked) by Penning traps. A further 7 cases (all T_z = -1 nuclei) have complete experimental datasets available, however the precision is not yet high enough to be included into the set of 14 currently-used emitters. Of these 7 cases, ^{18}Ne shows the largest deviation from the world average, with its uncertainty dominated by the 2.7% fractional uncertainty in its branching ratio (1975). A new GANIL measurement with a 0.7% uncertainty, with a further improvement at ISOLDE (2016 INTC), combined with an improved half-life measurement (TRIUMF), leaves the Q_{ec} value to be improved. This value was last measured at ISOLTRAP in 2004, with a current uncertainty on the Q value transition to the ground state of 589 eV. The excited 0^+ daughter state (the superallowed branch) is known to 80 eV. The goal of the proposal is to measure the isobaric pair ^{18}Ne/^{18}F to a precision of ~20 eV.

Recent work at ISOLTRAP has shown the power of using the Ramsey measurement scheme combined with mass doublets in order to reach a precision of around 20 eV. Any foreseen isobaric contaminants can be cleaned using the mass resolving power of the MR-TOF-MS, and the yield estimates, combined with the measurement procedure, provide a clear estimate of the beam time request. In this sense the

INTC see no causes for concern related to the technical procedure, nor the estimated precision. The main concern however is related to the impact of the measurement on the Ft value. Though this work will no doubt improve the Q_{ec} value, it is unlikely to lead to any changes in the FT value. Even if one assumed constancy of CVC and used the measurement for a test of the theoretical corrections, for example isospin symmetry, this light system is not the ideal case for testing the shell model, or radial wavefunctions. The INTC are therefore unconvinced about the impact of the physics case and cannot recommend awarding any beam time.

The INTC recommends 0 shifts for approval by the research board.

INTC-P-546 Collinear resonance ionization spectroscopy of RaF molecules *(ISOLDE: requested number of shifts (offline): 18)*

The proposal aims to use collinear resonance ionization spectroscopy to study the low-energy molecular structure of ^{225,226}RaF molecules. Diatomic molecules are suitable systems for studies of fundamental symmetries, with considerable effort focused on the study of fluoride molecules. Radium in particular is sensitive to parity-violating effects as well as for the search for electric dipole moments (EDM) and the RaF molecule is predicted to have one of the largest nuclear-spin-dependent P-odd interaction constants. Such “table-top experiments” are becoming recognized as being complementary to large-scale particle physics experiments supporting the efforts for the search for Physics beyond the Standard Model.

Experimental laser cooling techniques commonly used for atoms have in recent years been extended to molecular systems. The electronic structure for RaF is suitable for direct laser cooling, however with one critical caveat, all spectroscopic properties are unknown and are only predicted via ab-initio quantum-chemistry calculations. The goal of the CRIS collaboration is therefore focused on a determination of the excitation energy of the first excited state, and to measure the ionization potential. These parameters will firstly test the reliability of the calculations and most importantly, help to establish the laser cooling scheme.

The experiment does not require any protons. Should the authors wish to study ^{225}Ra however, the beam time would necessarily need to fit rather close to the end of a target change. The numbers provided for the expected rates include a detailed breakdown of efficiencies. Key to this work is the uncertain neutralization factor, quoted at 0.001, which limits the overall efficiency to 0.0005%. Nevertheless, the proponents appear to be confident that this is a conservative limit. The authors are also confident in the uncertainty of the theoretical estimates for the excited state and therefore present the laser scanning methodology assuming a search range of 1000 cm^{-1}, which will be narrowed and repeated with higher precision following the location of the resonance. It would have been useful to have had a little discussion as to the quality of theoretical estimates on molecules with existing spectroscopic information. Nevertheless the shift request is well motivated.

The INTC suggest that the authors focus on the search for the excited state and then work towards a measure of the ionization potential. For the moment, the need for a study of ^{225}Ra is not as critical and thus flexibility in the allocation of time to the different goals should be left to the CRIS collaboration. We suggest that the shift request is therefore awarded in full.

The INTC recommends 18 (offline, using an irradiated target) shifts for approval by the research board.

INTC-P-547 Probing low-lying states in ^{190}Pb via lifetime measurements *(ISOLDE: requested number of shifts: 11)*

The proposed experiment will measure level lifetimes in ^{190}Pb: the first 2^+ and 4^+, and the second 2^+. This isotope lies in the region of neutron-deficient nuclei characterised by shape-coexistence, with the most prominent example being ^{186}Pb in which two low-lying excited 0^+ states, corresponding to oblate and prolate deformed configurations, have been identified. In ^{190}Pb only one low-energy excited 0^+ state is known at 658 keV, and it is associated with a proton 2p-2h configuration and predicted to correspond to an oblate deformed intrinsic shape.

Limited experimental information is available on transition probabilities in neutron-deficient Pb isotopes and, therefore, the physics case for this experiment is rather strong. The objective is to provide information on the non-yrast intruder band, possibly based on a proton 4p-4h prolate configuration.

Lifetime measurements are proposed to provide an independent measure of the B(E2) values for the $2^+_1 \rightarrow 0^+_1$, $4^+_1 \rightarrow 2^+_1$ and $2^+_2 \rightarrow 0^+_1$ transitions. The problem is that, with the lifetimes of just three levels, it will be difficult to quantify the level of configuration mixing between yrast (spherical) and intruder (deformed) states. The lack of simulation in the proposal hampers the discussion of the effect of the degrader and the resolution which would be achievable. Furthermore, the link to other experimental data was not clearly made e.g in the relation of branching ratios and lifetime measurements. This region has been studied in some depth with a variety of techniques. However, the proposal focused mainly on theoretical calculations but did not discuss in detail previous experimental work, which would help to clarify the overall aims of the proposal and its eventual impact. For these reasons the committee does not recommend the proposal for approval.

The INTC recommends 0 shifts for approval by the research board.

INTC-P-521-ADD-1 Interaction of Na^+ ions with DNA G-quadruplex structures studied directly with Na beta-NMR spectroscopy *(ISOLDE: requested number of shifts: 8)*

This proposal is an addendum requesting additional shifts with $^{26}Na^+$ beams to investigate the interaction of Na^+ cations with DNA structures - here focusing on alternatives to the usual double helix (so-called G-quadruplex structures). The goal is to measure NMR chemical shifts and relaxation times in different conditions to investigate the structure and dynamics of Na+ interaction in these biological systems. The reaction of G-quadruplexes binding to alkali metals is strong and is expected to take place within a timescale reported to be tens of ms.

An impressive commissioning period has been underway since the September beam time in 2017. One of the main challenges is to efficiently transport the polarized probe atoms into the liquid sample with minimal loss of polarization, necessitating a careful setup of apertures, pinholes and general differential pumping. During the 5 shifts used in 2017, a number of activities took place, resulting in the demonstration of very narrow resonances of ^{26}Na seen with relaxation times in the 100ms range in several ionic liquids. These first tests focused on water solutions of DNA, mainly to compare to conventional NMR data in the literature.

A number of questions were put to the spokespersons including how the drift in the magnetic field will be corrected over time, whether the achieved beam line vacuum is sufficient for maintaining polarization in future studies, and whether the signal for the folding of the quadruplexes may be mimicked by other effects. The authors responded to these questions in full. The INTC find the proposal to be part of an exciting development of the VITO beam line, and recognize the importance of the work as reflected by the ERC awarded to the Spokesperson. The INTC therefore grants the beam time request in full.

The INTC recommends 8 shifts for approval by the research board.

Discussion on letters of Clarification

INTC-CLL-037 Investigation of Octupole Correlations in $^{144,145}Ba$ using the Recoil Distance Doppler-shift Technique *(ISOLDE: requested number of shifts: 15)*

The proposed experiment will measure level lifetimes in $^{144,145}Ba$. ^{144}Ba is at the centre of the Z=56, N=88 region of nuclei with pronounced octupole correlations, and a number of experimental and theoretical studies have indicated the presence of static octupole deformation in ^{144}Ba and ^{146}Ba.

In the clarification letter the authors present the results of a thorough study of the available literature with respect to the mechanism of incomplete fusion reactions. They illustrate and justify the choice of the relevant experimental parameters and thus demonstrate that the population of the excited states of interest in the nuclei $^{144,145}Ba$ is highly probable. In particular, previous estimates of the excitation energy distribution of ^{147}Ba populated following the transfer of a triton from the ^{7}Li target to the ^{144}Cs beam have been revised. The INTC appreciates the clarification of the open questions. The physics case (as discussed previously) is considered of high interest. In addition, it appears that the proposed reaction is capable not only of yielding structural information but is also of potential interest to the reaction community – where there could be unexplored synergies. The committee proposes that the requested shifts be approved.

The INTC recommends 15 shifts for approval by the research board.

Discussion on letters of Intent

INTC-I-206 Probing the density tail of radioactive nuclei with antiprotons (*ISOLDE/AD: letter of intent to INTC/SPSC*)

This joint letter of intent (LoI) to the INTC as well as the SPSC committee is a proposal to use trapped trapped antiprotons for a study of the structure of short-lived nuclei via nucleon annihilation. Antiprotons will be provided via the ELENA low-energy ring, with the aim of storing up to 10^9 in a dedicated, transportable trap, which can then be delivered to ISOLDE (or in the future elsewhere). The impact of the results may provide the necessary input to advocate a future antiproton-radioactive ion collider.

Three overall objectives are proposed, albeit little in the way of details are provided in the LoI to fully appreciate the extraction of the nuclear physics data (e. g. how close the antiproton will get to the nucleus before it annihilates): i) to discover new proton and neutron halos (for example possible p wave halos in very neutron-rich Ne and Mg isotopes), ii) to understand the development of neutron skins in medium-mass nuclei (for example via a study of the Sn isotopic chain), and iii) to provide a new observable that characterizes the density tail of short-lived nuclei. The determination of thick neutron skins and/or halos will provide new information on the nuclear many-body problem and the equation of state of neutron-rich matter at low density.

Antiprotons and the annihilation process from nucleon- and nucleus-antiproton collisions have been studied at CERN in the past, at LEAR and the AD, where the unique sensitivity of low-energy antiprotons to the surface of nuclei was demonstrated. Today however, no facility provides antiprotons to be used as probes for unstable nuclei. With the ERC award to the Spokesperson, the physics case has already been evaluated at a high level and the INTC understand that this LoI therefore represents a wish for a positive indication of support which would allow the Spokesperson to proceed towards a more formal proposal, with a final objective of being recognized in the future as a CERN experiment.

In the meantime, the INTC has received the LoI enthusiastically. A clear set of technical challenges are described, however the risks are superseded by the possible outcomes. One referee had a number of questions related to aspects of the methodology, and proposed trapping efficiencies. Additionally, the links with the existing GBAR experiment were also raised. The Spokesperson replied to every point in full. The INTC expressed support and will move towards inviting the Spokesperson to give a presentation at the next meeting.

The INTC supports the letter of intent and invites a more full discussion of the proposed work at a forthcoming meeting of the INTC.

INTC-I-207 An inelastic excitation study of multiple shape coexistence in ^{80}Zr *(ISOLDE: requested number of shifts: 0)*

The letter of intent is for an inelastic study of multiple shape coexistence in ^{80}Zr. The physics case for the proposed experiment is very strong. The rp-process waiting-point nucleus ^{80}Zr is located in the middle of the proton-rich region in which shape coexistence has been either observed or theoretically predicted. In particular, for ^{80}Zr state-of-the-art beyond mean-field studies predict the existence of multiple excited bands based on coexisting minima. In the theoretical study on which this LoI is based (Rodriguez, Egido, PLB **705**, 255 (2011)) five 0^+ states corresponding to different deformations are calculated below 2.25 MeV and a number of rotational bands, including gamma-bands, based on these states are predicted. Experimentally, on the other hand, only six members of the ground-state rotational band have been identified so far, with no B(E2) data or locations of excited 0^+ states. If successful, this experiment would provide valuable information on what appears to be a unique example of multiple shape coexistence, and also data on the role of the N=Z=40 shell gap in the formation of multiple deformed structures in this mass region. Although this is expected to be a very difficult beam to produce, experience with molecular beams such as ^{8}B suggest that the effort will be worthwhile and the target and ion source team are strongly encouraged to attempt to study these possibilities.

The INTC supports the proposal: (0 shifts for approval by the research board).

AOB:

The next meeting will take place on June 27 and 28. Following discussions with CERN management, it has been agreed that there will be no proposals accepted for running in 2018 or 2019. Reports on the operation of the facilities will be maintained as this will give an overview of how the 2018 programmes are proceeding.

It will also be requested that oral presentations laying out the long-term plans and status of projects which were previously discussed as letters of intent at recent INTC meetings can be presented. These include: the MIRACLS project (LOI197); SPECMAT (LOI191, 194, 195), Paul trap (LOI196) and LOI206 which has been discussed above.

The committee is further invited to suggest reviews for the June meeting which would address aspects of the facilities for which additional information would be deemed useful. The June meeting will take the form of a short half day on Wed 27th June and the morning of 28th. In addition, it is apparent that there will be no requirement to have both a November 2018 *and* February 2019 meeting; the precise planning for this will be communicated later.

The meeting was then closed.

Minutes taken by Karl Johnston