The chairman opened the meeting by welcoming the INTC referees; the absence of Jacek Dobaczewski was excused.

1. Facility reports during the open session

**ISOLDE technical report (Richard Catherall)**

Richard Catherall presented the ongoing shutdown work in preparation for the start-up of physics in 2016. As in most years, there is a considerable programme of modifications and upgrades taking place during the annual technical stop.

Modifications to the front end are being prepared to accommodate the new LIEBE (Liquid Eutectic Lead Bismuth loop target for future EURISOL) target. Feasibility tests have been demonstrated with regard to the metal shower and the prototype is now expected to be ready for online testing at the end of the physics run in 2016. At the front end there will be various modifications such as pulling of cables through the HT transfer tubes, changes to the water connections and also modifications to the shelf positions and robot programming.

A follow-up to the successful extraction of B beams in 2015 will be the development of carbonyl beams of refractory elements. This project aims to produce beams of difficult to release refractory elements by employing a neutron converter, U foils and CO-filler Mo container. Recoil fission products will be stopped in the CO gas releasing carbonyl molecules which will be broken up in a modified VADIS ion source.

Among the recent developments at RILIS is the integrated Photoionisation Spectroscopy Apparatus (PISA) which will be used as an *in-source* reference during laser runs. This can also be used for ionisation scheme developments and is being tested during the shutdown. The first element being explored using this setup is Eu.

The removal of the temporary and replacement by permanent shielding at the MEDICIS interface is progressing well, as is the final installation of the monotrac system.

In 2015 there were many problems with the coupling of targets on both front ends. This will be addressed in the coming weeks with a modification of the coupling table to relieve the forces on the ball bearings and an adjustable end-stop will be also installed. Furthermore, there will be a change of the GPS target coupling piston and there will also be changes of the faraday cage pistons. The new system has already been tested 1000 times off-line, equivalent to 10 years of operation. In addition to these significant changes, general maintenance will be performed on the BTY lines, the ventilation and verification of the robot settings will take place.

In the ISOLDE hall an upgrade of the vacuum controls has been performed as has an exchange of a vacuum valve on the HRS. The annual exchange of laser windows on both GPS and HRS is foreseen soon. A new fast tape station has been under production and will be installed at LA2 for tests during 2016 prior to replacing the old ISOLDE tape station. Finally, a new 60kV modulator will be tested. This promises a faster recovery time of about 1ms to within ~ +/- 1V. To confirm the findings, the new
modulator will be tested with a neutron converter in the presence of a MEDICIS target, to check for its performance in the “worst-case” scenario.

**ISOLDE physics report (K. Johnston)**

Karl Johnston presented an overview of the 2015 running campaign for ISOLDE and also the planning and user information for 2016.

In 2015 the physics programme began on April 15th and the low energy period ran for 30 weeks. From the 22nd October a special – but limited – HIE-ISOLDE running period allowed the first physics to be performed with Zn isotopes at 4MeV/u. In total there were 471 shifts for low energy requested of which 373 were scheduled; 265 were delivered which was a “success rate” of 70%, comparable to previous years.

The breakdown in subject areas for 2015 reflected a strong year for ISOLTRAP and the ISOLDE decay station while other areas – such as solid state physics which only had 9.6% of the beamtimes – were affected by target problems.

The 2016 schedule is being prepared. Protons will be delivered for setting up from 4th April and the first protons for physics will be available from April 11th. The low energy period will run from 11th April until the mid/end-August. Thereafter the priority will be given to HIE-ISOLDE physics.

To establish priorities for the HIE-ISOLDE running period a workshop was held on February 1st. 24 experiments have been identified as being able to take beam, and will avail of the full energy range in 2016 i.e. up to 5.5 MeV/u. The mass range will – in principle – run from the very light (\(^{6}\)Li) to the heavy (\(^{228}\)Ra). The majority of experiments will use Miniball/T-REX on XT01 but XT02 will also be available.

For ISOLDE users, there has been relatively few changes from 2015. As before all travelling setups need to be cleared by safety before use. The courses to be followed by all users needing access to the hall remain the same. The hands-on courses will again take place on Tuesday afternoons but the frequency may increase in the second half of the year as many new users are expected for the HIE-ISOLDE running period. Users have been reminded of the need to adopt better practice for controlling themselves before leaving the hall. Furthermore, the gates behind building 170 must remain closed.

Visits are an important part of ISOLDE’s visibility within CERN. There are no substantial changes to the procedures from 2015: all visits are pre-announced and discussed at the ISOLDE technical meeting every Tuesday afternoon. Kara Lynch coordinates the visits programme and should be contacted for specific questions. RP make a survey prior to each visit and visits must not take place during interventions in the hall which involve the transport of radioactive samples and/or opening of chambers/beamlines.

In building 508, the offline labs are now essentially installed, as is the workshop. The new visitors’ area and kitchen have been re-furnished and the new control room is in the process of being installed. All of these improvements should allow for a considerably more comfortable environment for users during their experimental campaigns in 2016.

Finally, in building 275, a new offline laboratory is available for experiments to prepare setups and detectors. A request should be sent to the coordinator for further information for those interested. The de-classification of the building continues apace and is nearing completion. The huge efforts of all the local teams in moving/removing and sorting their equipment in the past months is greatly appreciated. During this year’s campaign ENSAR2 funds will become available through the transnational access program.
HIE-ISOLDE status report (Y. Kadi)

Yacine Kadi presented an overview of the HIE-ISOLDE progress. The considerable achievements from 2015 were summarised: these included the validation of the cryomodule (CM) design choices validated by the superconducting cavities with beam. The RF coupler problem had been identified and a solution was pursued. In spite of the coupler problem, the physics run – albeit in a reduced mode, limited to 6 hours operation per day of the cryomodule – began on time on 22nd October.

The RF coupler has been the focus of continued tests in SM18 and it has been confirmed that the heating is due to pure RF heating. The key to the solution has been cooling the coupler antenna. The antenna will now be changed to Cu and a thermalisation involving welding this to an external cable has been found to solve the issue. Validation tests were performed in December 2015 and are now being applied to CM2. CM2 is now nearing completion and will be readied for transport to ISOLDE in the coming weeks.

CM1 has been dismounted at ISOLDE and was transported back to SM18 on 22nd January. It will be retrofitted with the modified couplers and will be received back at ISOLDE at the end of March 2016.

The schedule for preparing both CMs for physics in 2016 was then presented. The two CMs are expected to be at ISOLDE at the end of March, it is also expected that the new 9-gap RF amplifier for REX will be installed before this time. The hardware and beam commissioning of both CMs will run from May – middle August 2016. This will then allow for 12 weeks of HIE-ISOLDE physics beam time till the shutdown in November.

Status of nTOF facility (F. Gunsing)

Frank Gunsing presented the status of nTOF. An overview of the busy physics running from 2015 was shown which allowed measurements to be performed at both experimental areas utilising a total number of \(1.9 \times 10^{19}\) protons, greater than the allocated number of \(1.7 \times 10^{19}\) protons.

Numerous experiments were possible using \(^{12}C_{60}\) detectors and cross section data on \(^{70}\text{Ge}, ^{74}\text{Ge}, ^{76}\text{Ge}, ^{208}\text{Tl}, ^{242}\text{Pu}\) and \(^{237}\text{Np}\) were possible in EAR1 and \(^{171}\text{Tm}, ^{147}\text{Pm}, ^{33}\text{S}\) and \(^{7}\text{Be}\) in EAR2.

Some highlights from 2015 were then shown. Measurements on \(^{7}\text{Be}\) were presented. These logistically difficult experiments – for which the help received from RP was acknowledged – allowed preliminary results of the cross section to be presented, confirming the \(1/v\) cross-section dependence. These experiments will be complimented by further experiments in 2016 which will use a 1GBq source which will be prepared at ISOLDE following the offline mass separation of \(^{7}\text{BeNO}_3\). The close collaboration with ISOLDE in producing both the sample and for the use of the class A lab for sample mounting was once again very much appreciated.

The commissioning of the EAR2 area continued throughout 2015, beam profiles were measured using MicroMegas and PPACs detectors. In addition, the recent installation of STEFF (SpecTrometer for Exotic Fragments) for the study of fission fragments in EAR2, was completed towards the end of the year. Data from \(^{197}\text{Au(n, }\gamma)^\prime\) showed notable improvements following an improved NaI response. In addition imaging tests from EAR2 showed some promise and will be explored in more detail in the future. New data on the cross sections of \(^{242}\text{Pu}\) were also presented.

The measurement planning for 2016 was also presented, with a very full year again in prospect. The year will begin with the measurement of \(^{7}\text{Be}\) at EAR2 and will feature 12 other experiments until the end of protons in November. The request is similar to 2015, expecting \(1.9 \times 10^{19}\) in total.
Documents presented during the open session

1. Laser Spectroscopy of neutron-deficient Sn isotopes Ronald Garcia Ruiz (University of Manchester (UK)) P-456

2. Study of neutron-rich $^{52,53}$K isotopes by the measurement of spins, moments and charge radii Xiaofei Yang (KU Leuven (BE)) P-458

3. Local investigation of impurities in wide band gap nanostructured oxides with radioactive probes Artur Carbonari (IPEN) P-452

4. Novel diagnostic and therapeutic radionuclides for the development of innovative radiopharmaceuticals Dr. Cristina Muller (PSI) and Dr Nick Van der Meulen P-312-ADD-2

5. Neutron capture cross section of $^{88}$Sr and $^{89}$Y Giuseppe Tagliente (Universita e INFN, Bari (IT)), Nicola Colonna (Universita e INFN, Bari (IT)) P-453

6. Decay study of the onset of deformation in the (A~100, N=60) region by $\beta$-decay of $^{97}$Kr Christophe Sotty (IFIN-HH Bucharest (RO)) P-457

7. Unraveling the local structure of topological crystalline insulators using hyperfine interactions Lino Pereira (KU Leuven (BE)) P-455

8. Reaction mechanisms in collisions induced by $^8$B beam close to the barrier Alessia di pietro (INFN) P-463

9. Study of molybdenum oxide by means of Perturbed Angular Correlations and Mössbauer spectroscopy Juliana Schell (Universitaet des Saarlandes (DE)) P-454

10. Mass spectrometry of neutron-rich chromium isotopes into the N = 40 "island of inversion" Vladimir Manea (Max-Planck-Gesellschaft (DE)) P-317-ADD-3

11. Study of neutron-rich $^{53-54}$Ca isotopes via beta-decay of $^{54}$K Andrea Gottardo (Institut de Physique Nucléaire d'Orsay - IPN) P-425-ADD-1

12. Electron capture of $^8$B into highly excited states in $^8$Be Alan Michael Howard (University Aarhus) P-460

13. Multiple Coulomb excitation of a neutron rich $^{88}$Kr beam to study symmetric and mixed symmetric states in inverse kinematics Kevin Moschner (Universitaet zu Koeln (DE)) P-461

14. Determination of the electron affinity of astatine and polonium by laser photodetachment Dag Hanstorp (University of Gothenburg (SE)) P-462

15. Measurement of the super-allowed branching ratio of $^{22}$Mg Bertram Blank (CEN Bordeaux-Gradignan) P-459

16. Laser spectroscopic studies along the Al isotopic chain and the isomer-shift of the self-conjugate $^{26}$Al nucleus Stephan Malbrunot (CERN) P-464
2. Discussions during closed session

Present:

Klaus Blaum (INTC Chairman), Karl Johnston (Scientific Secretary), Enda McGlynn, Thomas Prokscha, Bertram Blank, Wilton Catford, François de Oliveira, Raquel Crespo, Michael Block, Giacomo de Angelis, Arnd Junghans; Maria Garcia Borge; Thierry Stora; Yacine Kadi; Enrico Chiaveri; Frank Gunsing; Daniela Macina; Eckard Elsen (partly).

(excused) Jacek Dobaczewski

The chairman opened the closed session. The minutes of the 51st INTC meeting were approved.

Matters arising from the previous minutes:

The workshop on HIE-ISOLDE physics on Feb 1st was presented where a lively discussion about the physics programme for 2016 and beyond on HIE-ISOLDE was pursued. The INTC fully supports the efforts of the technical teams to realise the programme for 2016 and congratulates them again for the successes of 2015.

Discussion of the Facility reports:

1. ISOLDE technical and physics report

The presentations from Richard Catherall and Karl Johnston on the technical and physics aspects of ISOLDE were discussed. The question arising from the open session about the number of shifts dedicated to TISD was once again raised. It had not been included in the open session presentation leading to some confusion. The chairman made a request that a breakdown of these shifts be prepared for the next INTC meeting. Re-examining the shifts from 2015 it was found that 30 shifts were given to TISD for the development of the nanotube target, boron beams etc.

2. HIE-ISOLDE project

There were no comments to the HIE-ISOLDE presentation. The committee are happy with the progress in identifying and solving the problem with the RF coupler and look forward to the 12 weeks of HIE-ISOLDE physics starting in the Autumn.

3. n_Tof

The presentation of Frank Gunsing was then discussed. A question about the running period for ⁷Be was asked, especially if the proposed running period chosen was sufficiently long to achieve good statistics. Given the apparently structure-free nature of the ⁷Be data it would appear that even running 1-2 weeks longer will not give significantly extra statistics, but running for longer should not be ruled out; such a flexibility in the n_Tof planning should be considered if necessary, as the target will not be available later in the year following its decay.

Although considerable collaboration between the various groups at ISOLDE and n_Tof was in evidence for the upcoming ⁷Be collections – and which have already been approved at previous INTC meetings – it was felt that better communication and discussion about the scheduling would prevent some of the misunderstandings which have still arisen in this particular case.
4. Count rate estimations for n_TOF

Frank Gunsing then presented an overview on count rate estimations used at nToF.

The procedure for normalization considerations was illustrated, showing how this is achieved irrespective of sample thicknesses. The statistical approach was fully discussed and the difficulties that are encountered in high energy regions were mentioned, especially with regard to how this is often presented in proposals to the INTC. An experimental example featuring Am was then shown where the thermal cross section was measured.

All of the uncertainties need to be reported to including sufficient information to reconstruct the full covariance matrix. There also has been a recommendation that time-of-flight data be submitted to EXFOR (Experimental Nuclear Reaction Data), as detailed in IAEA Report INDC(NDS)-0647.

The INTC members acknowledged the excellent and informative presentation by Frank Gunsing.

Discussions and recommendations for the letters of intent (not presented in the open session)

1. CERN-INTC-2016-002 I-165 Measurement of the $^{235}$U(n, f) cross section relative to the H(n, n)H reaction up to 1 GeV: test of a Proton Recoil Telescope. L. Cosentino; C. Massimi; R. Nolte

This letter of intent proposes to develop and test a proton recoil telescope (PRT) at EAR1 of the n_TOF facility to measure the H(n,n)H elastic scattering cross section. The final goal of the authors is the measurement of the $^{235}$U(n,f) fission cross section in the energy range between 200 MeV and 1 GeV, where no experimental data are available. The fission cross section will be determined relative to the H(n,n)H elastic scattering cross section, which will be measured simultaneously with the PRT developed in this LoI. Therefore, the PRT is indispensable for the $^{235}$U(n,f) fission cross section measurement.

The experimental determination of the $^{235}$U(n,f) fission cross section in the 200 MeV – 1 GeV range is motivated by its importance in applications and fundamental nuclear physics – supported by the long-standing demand of IAEA to improve the experimental situation – as well as by recent discrepancies in theoretical calculations which are at present the only source for the fission cross section in this energy range. Furthermore, measuring of the H(n,n)H reaction will allow a better determination of the neutron fluence at n_TOF for neutron energies higher than 200 MeV, which will improve the accuracy of other neutron induced fission cross sections measured at n-TOF.

Preliminary tests with a very fast BC408 detector showed that it is possible to discriminate between the $\gamma$-flash and neutrons of energies up to 1.5 GeV. This demonstrates the feasibility of the planned experiments. Several slabs of solid state, plastic or inorganic scintillators with independent read-out are proposed to be tested for the PRT, where Monte Carlo simulations are currently being performed to determine the final configuration of the PRT.

Due to its very wide neutron energy spectrum the n_TOF facility is ideally suited for this kind of experiments. The plan for the experiment is well thought-out. The committee recommends fully supporting this LOI and recommending that 1e18 protons be awarded.
2. CERN-INTC-2016-014 I-166 Optimisation of clinical SPECT imaging with 155Tb for theragnostic radionuclide therapy T. E. Cocolios; A. Robinson

This Letter of Intent concerns $^{155}$Tb which is a 5-day half-life gamma emitter and is proposed for use in imaging using the SPECT single-photon technique. This group propose to collect activity during the existing experiment IS528 (spokesperson U. Koester, also on this proposal). A new collection chamber is being designed at KU Leuven in collaboration with the group at CERN and will be tested before deployment at ISOLDE. The appendix indicates an activity of 1 MBq which needs to be cleared and shipped to the UK. The UK hospital is The Christie, which is a European-level centre for cancer treatment and imaging. The experimental aim is to optimise the SPECT collimators and analysis and operation for the different gamma-ray energies from $^{155}$Tb compared to $^{99}$Tc that was the basis for the original SPECT design. There is clearly a substantial optimisation project to be completed. The Christie is a good choice of collaborator, with good links already established and it should achieve buy-in from clinicians at the same time.

Collecting and transporting the activity is a challenge for ISOLDE together with the collaborators and it is timely to start now (as proposed) at solving the related issues and also getting the research started at the hospital.

The Letter of Intent is strongly supported. No shifts are required.

3. CERN-INTC-2016-016 I-167 n-TOF Total Absorption Calorimeter re-commissioning Eric Berthoumieux

This letter concerns the degradation in performance of a total absorption calorimeter (TAC) which has been operational at EAR1 since 2003. This loss of performance originates from the ageing of the voltage dividers, and the resolution is now 18% compared to an average value of 14.3% previously. The TAC consists of 40 BaF$_2$ crystals. A new voltage divider has been developed for the BaF$_2$ detectors in the array to remedy this situation. Furthermore, the useful energy range for TAC measurements will be investigated.

The gain stability of the detector has been investigated previously with a $^{233}$U sample which had a $^{232}$U impurity with a short half-life decaying to $^{208}$Tl: the sum peak of which has a 3.2MeV in $^{208}$Pb. This peak can be used as a monitor for gain stability and resolution. The peak position of this decay can be used to monitor the gain stability and resolution. A smooth drift from the gamma flash recovery is superimposed by a structure due to the instantaneous count rate changes due to the resonance structure that was found in the capture cross section measurement. Using an external Y source and gold sample the intention is to mimic beam conditions with sources. The importance of gaining knowledge about the gamma-flash is under real experimental conditions; it cannot be simulated.

The letter of intent is therefore strongly supported and the committee approves the request of $8\times10^7$ protons.

Recommendations for the proposals and addenda presented in the open session

1. CERN-INTC-2016-006 P-456 Laser Spectroscopy of neutron deficient Sn isotopes Ronald Garcia Ruiz

The proposal intends to measure the spins, electromagnetic moment and charge radii of neutron-deficient Sn isotopes, possibly out to $^{101}$Sn. The study of nuclear structure of Sn isotopes is of prime importance to investigate the evolution of nuclear structure, in particular of single particle states, of
this magic isotopic chain. The technique to be used is the CRIS method developed at ISOLDE. It was demonstrated in the past that measurements with counting rates as low as 50-100 pps can be made successfully within a few hours. Therefore, this is the method of choice for the most exotic nuclei with the smallest rates, although the prospects with narrow-band excitation as proposed in the present proposal needs still to be demonstrated clearly. The rates given during the presentation are by far too small for a successful experiment on $^{101}\text{Sn}$ and shed severe doubts on the feasibility of $^{102}\text{Sn}$.

**Therefore, the INTC proposes to grant 15 shifts to start the measurements with the less exotic Sn isotopes up to $^{103}\text{Sn}$ and 2 shifts for the reference cases. These measurements will also allow the authors to get solid numbers for the yields of neutron-deficient Sn isotopes for a possible extension to more exotic nuclei.**

2. CERN-INTC-2016-008 P-458 Study of neutron-rich $^{52,53}\text{K}$ isotopes by the measurement of spins, moments and charge radii Xiaofei Yang

In this proposal the authors intent to make a measurement of spins, magnetic moments and charge radii of the $^{52,53}\text{K}$ isotopes thus extending a previous experiment (IS484) where this study was performed up to $N=32$, with the aim of providing insight into shell evolution, in particular the development of the shell closures at $N=32,34$. Describing these novel structures is a challenge from structure theories developed for nuclei at the stability line. In this mass region, a key role in the appearance of new magic numbers far from the stability line appears to be related to some components of the strong interaction between protons and neutrons and three-body forces.

There are some issues of concern in this proposal in terms of experimental details. Before beam time is granted, the proposers should demonstrate that after the presented case of broad-band excitation with $^{202}\text{Fr}$, narrow-band excitation yields the results expected. This would also allow them to give a more detailed beam-time request based on experimental numbers. In addition, the proposal will greatly benefit from state-of-the-art theoretical structure calculations that can be available in this mass region, and could shed light onto the origin of shell evolution. In particular, the fact that there is no effect on charge radii at $N=20$, whereas there is a significant effect at $N=28$ should be elucidated.

**The INTC asks therefore for a clarification letter which demonstrates technically that the experiment as proposed can be carried out.**

3. CERN-INTC-2016-001 P-452 Local investigation of impurities in wide band gap nanostructured oxides with radioactive probes Artur Carbonari

This proposal requests 9 shifts in order to make PAC measurements, using Cd and In isotopes, in a variety of metal oxide materials (vandadium, titantium, indium and gallium). The measurements of the collected isotopes will be done off line at the Solid State Laboratory in building 508. Some background is given on the scientific/technological relevance of each of the different materials and in some cases indications of open scientific issues are of a general nature.

The metal oxides the proposers identify are certainly of both scientific and technological interest and undoubtedly a range of interesting problems remain open, to which PAC could be usefully and profitably applied. That being said, the present proposal is very “open” in that there is relatively little detail about exactly what problems the proposers will tackle, especially in the case of vanadium and titanium. In the case of the Ga/In oxide alloys, it appears that the issue to be explored is the crystal structure of the alloys as a function of indium molar parameter. However, PAC using the ISOLDE facility does appear to be a very expensive route to take to gain such seemingly general “crystal-level” information compared to XRD, TEM-SAED etc. Furthermore, the justification for the use of 2 ions is less than compelling, in that the actual charge state and doping nature of the
implanted species will depend on the local environment (substitutional, interstitial etc.) and this seems to be uncertain at the present state of knowledge of some materials, especially where the coordination number of the cation can vary and also, given the large number of defects which are likely already present in these materials, which can shift the Fermi level and affect the implanted species charge state.

Overall the committee agreed that the proposal lacked sufficient detail in terms of exactly what off-line studies will be performed to properly judge its scientific merit, especially in respect of whether expensive ISOLDE beam-time is justified, or whether other, more standard, techniques could provide some of the information. Although the materials proposed for study are certainly of scientific merit, a clearer, more focused proposal is required.

The committee recommends that no shifts be allocated.

4. CERN-INTC-2016-009 P-312-ADD-2 Novel diagnostic and therapeutic radionuclides for the development of innovative radiopharmaceuticals Ulli Köster

This proposal requests 35 shifts (33 newly requested) in order to explore novel radionuclides with diagnostic or therapeutic properties from ISOLDE. This work should allow better understanding of radiopharmaceutical science with the ultimate aim of developing superior treatments. The proposal wishes to study (i) the quadruplet of diagnostic and therapeutic Tb isotopes (in particular $^{149}$Tb and $^{152}$Tb), (ii) $^{140}$Nd and $^{134}$Ce and (iii) exploratory studies with other novel radioisotopes ($^{71,72,74}$As, $^{73}$Se, $^{84}$Rb, $^{117m}$Sn, $^{200,203}$Pb or $^{203-206}$Bi, $^{211}$At and $^{211}$Rn).

The proposal aims to the exploration of novel radionuclides all with diagnostic or therapeutical properties. The general aim of the program is very challenging. The production of most of them can only be done at ISOLDE. In this proposal the systematic investigation of the biological response of those radionuclides is addressed through the production of sufficient radioactivity to treat a statistical significant number of probes.

Given the breadth of research themes, and taking into account that the research along many of the themes is at a significantly more advanced stage than at the time of the original proposal in 2011, it might be better at this stage (for all stakeholders including the proposers, the INTC and the ISOLDE personnel) to begin to split the more detailed follow-up studies (i.e. after the initial explorations/proof of concept stage) into distinct proposals which can be judged on their own individual merits, rather than continuing to pack everything into one package so that one either supports or rejects the entire package. On the basis of these comments, the more advanced Tb programme may now be considered to be separate to the other more exploratory isotopes mentioned above.

With this in mind the committee recommends approving 20 shifts to allow the 2016 programme to be pursued and 3 shifts for opportunistic experiments. A status report on the 2016 programme will be requested at the February 2017 meeting.

5. CERN-INTC-2016-003 P-453 Neutron capture cross section of $^{88}$Sr and $^{89}$Y. G Tagliente; N. Colonna

This proposal is mainly motivated by nuclear astrophysics questions. Strontium and Yttrium abundances have been measured in the solar system, in pre-solar grains, and also stars. They are relatively abundant elements. The two elements are located in the first peak of abundance that is located after the peak of iron. Stellar models show that they are mostly (> 95 %) synthesized by the s-process in AGB stars. As a consequence, they have been used as references to constrain stellar models. The most neutron rich stable isotopes, $^{88}$Sr and $^{89}$Y, have both a magic number of neutrons
N=50, which implies that their radiative neutron-capture cross sections are lower than those of the neighboring nuclei. Consequently, these isotopes act as bottlenecks on the neutron-capture path. So, it is very important to know the neutron capture cross sections on these nuclei to understand their astrophysical origin and the origin of the heavier nuclei. These new data will be also used to test and constrain the different stellar models. This proposal is also motivated by applications in emerging nuclear technologies. Yttriumhydride could be used as a moderator in thermal nuclear reactors, as an inert matrix fuel, and as a component of magnets in fusion reactors. Here also, measurements of the neutron capture cross sections are needed. There are few data available for the two reactions at low energies. The recommended cross sections from the different evaluations fit badly the existing data. A time-of-flight measurement of the capture cross section has the advantage compared to activation measurements that the astrophysical relevant Maxwellian averaged cross section can be determined for different stellar temperatures. So clearly, new measurements would put stronger constraints on the cross sections. It is proposed to measure the cross sections at n-tof EAR1 using a C6D6 liquid scintillator and pure targets with very small amounts of contaminants. The count rates seem correct. These include background and normalization measurements. They are supported by simulations.

The proposal is recommended to receive the total number of protons (3.5e18)

6. CERN-INTC-2016-007 P-457 Decay study of the onset of deformation in the (A=100, N = 60) region by β-decay of 97Kr C. Sotty; C.R. Nita

In this proposal the authors intend to make a study of 97Rb via β-decay of 97Kr using the recently commissioned ISOLDE Decay Station (IDS) with the aim of describing shape coexistence and transition in this region of the nuclear landscape. This would be following up some very impressive Coulomb excitation work done at ISOLDE and published at PRL. In particular, in this proposal one key aim is to measure for the first time the lifetimes of the 5/2+ and 7/2+ states belonging to the ground state deformed band and to characterize the 76 keV isomer in terms of its deformation or structure. In addition, to validate the model-dependent matrix elements for the transitions obtained from previous work.

There are many issues of concern in this proposal and with this experiment, both at the fundamental level and also in terms of experimental details.

Of the various excited states proposed for study, it seems likely that only one will be strongly populated and also most of the beta-decay will go to the ground state. Other transitions are mostly forbidden and hence should have much lower intensity. It may be speculated that the decay from the 3/2+ parent might populate high-lying low spin states that subsequently gamma-decay via the interesting lower states (because the Q-value opens up this possibility), but this idea would require some support based on calculations or on the decays of similar adjacent nuclei.

The shift request shown in the presentation is substantially revised in the light of some more optimistic beam rate projections from the TAC, but also the presentation removed one of the originally proposed two parts of more than 20 shifts each. That is, the electron spectroscopy was removed and there are revisions to the gamma-ray experiment.

The estimates of beam time do not take proper account of the expected β-decay feeding and the suggestion of gamma-gamma timing is overly optimistic. The β-γ timing with very low energy gamma-rays is extremely demanding and can’t realistically achieve the sub-nanosecond resolutions to the degree that is mentioned, so the lifetime measurements are severely challenging.
The importance of the structure of $^{97}$Rb and the proper understanding of this mass region is recognized, but in view of all of the above concerns with these specific experimental plans, the proposal cannot be endorsed and no shifts are recommended for approval to the research board.

7. CERN-INTC-2016-005 P-455 Unraveling the local structure of topological crystalline insulators using hyperfine interactions  L.M.C. Pereira

This proposal requests 15 shifts in order to use PAC and eMS techniques to study the effects of changes in the tin molar fraction in high-quality epitaxial films of the alloys Pb$_{1-x}$Sn$_x$Te and Ge$_{1-x}$Sn$_x$Te on the rhombohedral distortion as a function of temperature. In particular, the authors propose to study the sublattice displacement in the cubic and rhombohedral phases through the cubic-to-rhombohedral phase transition to determine, whether the nature of the phase transition is displacive or order-disorder.

These hyperfine interaction measurements will be complemented by SR-XRD and ARPES measurements. The combination of all three studies will allow to determine the topological phase diagram of Pb$_{1-x}$Sn$_x$Te and Ge$_{1-x}$Sn$_x$Te as a function of rhombohedral distortion.

The proposal tackles a topic at the forefront of materials physics in terms of the understanding of the phase diagrams of topological crystalline insulators. The proposed work is quite focussed and has clearly stated objectives, and also clearly justifies the need for the use of the ISOLDE facility in terms of studying very specific issues such as the sublattice displacements in these materials which are not amenable to XRD, and where EXAFS, the standard technique for probing local distortions, cannot provide the required precision for the thin film samples. The use of ISOLDE is further justified by the need for eMS rather than conventional MS, where the time scales for measurements via the conventional technique are not at all suitable and where the eMS facility at ISOLDE offers a very suitable capability.

The proposal is focussed, well written and justified. The class of materials proposed for the study is at the forefront of the area of materials physics and the specific goals are clearly of importance for the research on other materials of similar topological nature.

Hence the committee recommends supporting this beam request at the level stated in the proposal i.e. 15 shifts.

8. CERN-INTC-2016-018 P-463 Reaction mechanisms in collisions induced by $^8$B beam close to the barrier A.Di Pietro; P.Figuera

It was accepted by the committee that there is wide interest among reaction specialists in the reaction mechanism of halo and weakly bound projectiles. This experimental group is expert in the type of measurements proposed, has a track record of successful measurements with other weakly bound projectiles such as $^{11}$Be, and has excellent engagement with leading theorists. The proposed experiment uniquely includes exclusive coincidence measurements and makes use of the unique ISOLDE provision of reaccelerated $^8$B projectiles. The topic is extremely complicated and challenging theoretically and to get a completely conclusive result from this one experiment is perhaps not possible (and indeed was not claimed by the proposal), so a judgement is needed on the appropriate investment of beam time to take advantage of the significant experimental improvements offered by this group and also the unique ISOLDE $^8$B beam.

The committee recommend 20 shifts for the whole experiment to be used as appropriate, taking into account that sufficient statistics for the $^8$B part should be achievable within this time at the most relevant angles, and also that there admittedly remain some uncertainties in
the beam production intensity (which argues against committing a full 29 shifts to this experiment). The group should return with a new proposal if it is strongly believed that the experiment is not feasible in this amount of beam time.


The authors of P 454 propose to study the incorporation of selected dopants such as In and Cd in Molybdenum oxide compounds by ion implantation. At ISOLDE they suggest to perform studies using the Perturbed Angular Correlations technique and Mössbauer spectroscopy. The specific objectives of this project are to study at the atomic scale the probe’s local environment, its electronic configuration and polarization, the probe’s lattice sites, point defects and its recombination dynamics varying different parameters like the annealing temperature and atmosphere.

The study of Mo-Oxides seems scientifically interesting and the material is of technological importance. The proposal presents a clear work plan and the beam time request is clearly presented and considered to be adequate. The proposed experiments can be done along with other already approved proposals from the material science community

The INTC recommends approving the proposal and granting all the requested 9 shifts.

10. CERN-INTC-2016-011 P-317-ADD-3 Mass spectrometry of neutron-rich chromium isotopes into the N = 40 “island of inversion” Susanne Kreim; Vladimir Manea

In this proposal the authors aim to perform mass measurements of neutron-rich chromium isotopes with the ISOLTRAP setup to study the nuclear structure into the N=40 second island of inversion and get precise information on structural changes along the Cr isotope chain.

The neutron-rich chromium isotopes in the region around N=40 are known to show an onset of collectivity based on recent Coulomb excitation experiments.

It is also known that nuclear binding energies are sensitive probes to the onset of deformation showing a significant enhancement in the region where the structural change occurs due to an increase of correlations.

Available mass measurements for this isotope chain show significant discrepancies with respect to the signature of the onset of deformation.

Even though no immediate impact on theoretical models is expected, the availability of a set of different and very precise observables, will provide key information on shell evolution and structural changes, and a steam for further novel nuclear structure developments.

The committee recommends that the requested 13 shifts are granted.

11. CERN-INTC-2016-012 P-425-ADD-1 Study of neutron-rich $^{53,54}$Ca isotopes via beta-decay of $^{54}$K A. Gottardo; R. Grzywacz; M. Madurga

The addendum proposes to study excited states in $^{54}$Ca via beta decay of $^{54}$K and in $^{53}$Ca via beta-delayed neutron emission of the same nucleus. IDS will be used together with VANDLE, a germanium setup and a beta detector. The experimenters expect to distinguish between different shell-model interactions notably of 3N interactions. First experimental data, mainly the production rate, have been obtained during a previous run and at RIKEN via a knock-out reaction.
There is a large uncertainty concerning the production rate. The rate obtained in the past of 3 pps could not be reached during the test in 2015, where only 0.3 pps were reached. A possible reason is the use of an already used source. Therefore, the authors assume a rate of only 0.5 pps yielding a total of 21 shifts to obtain 20000 neutrons in VANDLE and 500 n-gamma events.

The large uncertainty in the production rate makes it rather difficult to appreciate the number of shifts needed.

The INTC recommended that 15 shifts are approved which, even in the worst case scenario of 0.3 pps, should not put into danger the success of the experiment.

12. CERN-INTC-2016-013 P-460  Electron capture of $^8$B into highly excited states in $^8$Be A. M. Howard

The motivation of this study is written in this proposal with only one sentence, which is really too short. The astrophysical motivation is found in the reference [2]. It is related to the solar neutrino measurements. $^8$B provides the main source of solar neutrinos above 2 MeV and hence the only source of detectable solar neutrinos for the neutrino detectors Super-Kamiokande and Sudbury Neutrino Observatory (SNO), which both have a detection threshold of 4 MeV. Accurate knowledge of the $^8$B neutrino spectrum is of great importance to the interpretation of these solar neutrino measurements.

However, the $^8$B beta decay is already well known. The deduced neutrino spectrum is very well known, with a precision better than 1% for most of the energy range. The states of interest in this proposal are located at high excitation energies in $^8$Be. These states modify the $^8$B neutrino spectrum only in the very low energy range, below 2 MeV. In this range of energy, the neutrino spectrum is dominated by other contributions (p+p chain). Therefore, the astrophysical motivation of the proposal is not valid.

The nuclear physics motivation is not clear. There is a well-established T=1, 1+ state in $^8$Be at 17.64 MeV, with a proton width of 10.7 ± 0.5 keV. Only a first measured value for the branching ratio could be expected from the proposed experiment. The impact of an accurate measurement of this very low BR was not explained. The fact that a very weak channel has not yet been observed does not justify by itself a new measurement.

In view of the incorrect and incomplete motivations, the INTC recommends not to support the proposal.

13. CERN-INTC-2016-015 P-461  Multiple coulomb excitation of a neutron rich $^{88}$Kr beam to study symmetric and mixed symmetric states in inverse kinematics K. Moschner

This proposal summarises the motivation as being to confirm the M1 character of the 2+ to 2+ decay of the mixed symmetry state in $^{88}$Kr recently identified and studied at PreSPEC and hence to complete the characterisation of the mixed symmetry state. It would represent the third experiment largely motivated by this state, following the PreSPEC experiment and an earlier low-energy coulex experiment at REX-ISOLDE.

The motivation for understanding this particular mixed symmetry state in detail is given in terms of the tractability of microscopic shell model calculations, which will allow the IBM description to be interpreted microscopically. It is clear that the higher energy of the HIE-ISOLDE beam would give a much improved population of the higher-lying excited states. It is
not really clear why the error bars in the first coulex measurement appeared not to be believed in the presentation and hence the case to improve the situation regarding the first 2+ state was not well made. The advances made with the PreSPEC measurement regarding the third 2+ state (although not quite yet published) have significantly advanced the situation regarding this mixed symmetry state. The required beam time for the proposed experiment is calculated to give sufficient statistics in the gamma-ray angular distributions to determine multipolarities.

Taking all of this into account, the case to award beam time to this proposal was not sufficiently strong and no shifts have been awarded.

14. CERN-INTC-2016-017 P-462 Determination of the electron affinity of astatine and polonium by laser photodetachment S. Rothe

The authors propose to measure the electron affinity EA of astatine and polonium by collinear detachment spectroscopy with a precision of better than 0.1 meV. The required negative ion-beams of At and Po are only available at the ISOLDE facility. The feasibility of the proposed methodology by using collinear laser photo-detachment has been demonstrated by off-line tests on stable iodine ions obtained from a negative ion source within the approved LoI I-148.

A better knowledge of At chemistry is indispensable for its efficient use in nuclear medicine applications. For Po the knowledge of ionization potential IP and EA are crucial for the development of decorporation treatments of actinides in medicine, and for the understanding of its chemical behaviour in natural systems (long-term management of abandoned U mines). The IPs of At and Po have been recently measured at ISOLDE, whereas the measurements of EA are still lacking. Besides the interest in understanding the fundamental atomic properties and the related chemistry these experiments are also necessary to further benchmark quantum mechanical calculations. New and higher accuracy calculations of state-of-the-art theories (ref [3]) – such as relativistic coupled cluster methods – are addressed in the proposal, as requested by the committee for LoI I-148. Due to the ultra-low available quantities of At and Po reliable calculations are mandatory for understanding the chemistry of these elements. These computations benefit greatly from validation provided by the proposed experiments.

The proposal is well motivated and the experimental setup has been developed and successfully tested on stable iodine within I-148. The expected ion beam rate is not firmly established, which may reduce the achievable precision of the experiment. Based on the proposed improvements given in the detailed response to the TAC comment an EA measurement with a resolution of order 1 meV should be feasible with the expected beam rate. Since EA is experimentally unknown a first measurement with moderate precision is already an important achievement.

The INTC recommends supporting this proposal, with a reduction of shifts from 15 to 9. This will still allow a measurement of EA with a resolution in the meV range.

15. CERN-INTC-2016-010 P-459 Measurement of the super-allowed branching ratio of $^{22}$Mg B. Blank

The proposal aims to improve measurements of the beta-decay properties of $^{22}$Mg by a factor of 2 (branching-ratio) and 3 (half-life). The question of improving these data is of paramount importance for the world collection of results pertaining to superallowed transitions that determine fundamental characteristics of the Standard Model and put stringent conditions on new physics beyond. The improvement can only be achieved by repeating the measurements in different settings and taking the average. The particular case of $^{22}$Mg was previously measured only once and other experiment(s) aiming at this nucleus are very much called for. Painstaking improvements of precision are here absolutely necessary, as they constitute one of the greatest
service of nuclear physics towards the understanding of fundamental properties of nature. The number of shifts requested is quite moderate and is an extremely efficient use of ISOLDE.

The committee recommends approving all requested 10 shifts.

16. CERN-INTC-2016-019 P-464 Laser spectroscopic studies along the Al isotopic chain and the isomer-shift of the self-conjugate $^{26}\text{Al}$ nucleus Hanne Heylen; Stephan Ettenauer

Proposal P 464 is concerned with measurements of changes in nuclear charge radii in the Al isotopic chain from $^{24}\text{Al}$ to $^{33}\text{Al}$ by laser spectroscopy. The measurements address three different physics topics: proton-neutron pairing, nuclear structure corrections in the super allowed beta decay, and the nuclear structure evolution around the so-called island of inversion.

The INTC considers the presented science cases interesting. In particular, the measurement related to the $V_{ud}$ determination is compelling. As recently demonstrated in $^{74}\text{Rb}$ accurate charge radii allow improving the nuclear structure correction $\delta_c$ to the $F_t$ value. Since this correction is limiting the uncertainty in $^{26}\text{Al}$ a precise charge radius will have an immediate impact on the corrected $F_t$ value and the test of CKM unitarity.

While the study of pn-pairing by the isomer shift in $^{26}\text{Al}$ is of interest, extending these measurements to additional N=Z nuclei would be more attractive than measurements along the Al isotopic chain.

The studies of the structure evolution across the island of inversion are less appealing as no surprise compared to the present knowledge is expected. Nonetheless, a systematic investigation on shell evolution and structural changes via a different observable has some value.

The technique is well established and the beam request is sound. However, there are some concerns with respect to Al-24,25 yields that have not been measured at ISOLDE yet.

Thus, the INTC recommends approving 16 shifts for measurements in $^{26-33}\text{Al}$, one shift of which should be dedicated to the yield measurements in $^{24-25}\text{Al}$.

3. A.O.B

The mandates of various INTC referees was then presented. Several referees have their mandate approaching its end in 2016. Those who wish to extend their mandate are requested to consider this, and possible new members can be proposed.

The next meeting of the INTC will take place 29 – 30 June 2016.

Minutes taken by Karl Johnston