Group for Upgrade of Isolde GUI meeting – 29th Sept 2016 - DRAFT

Participants : Kieran Flanaghan by phone, B. Marsh (invited), M. Delonca (invited), T. Cocolios (by phone), J. Vollaire, T. Giles (invited), K. Riisager, V. Fedosseev, S. Gilardoni, R. Catherall, M Borge, J. Ballof (invited), K. Johnston

Excused : B. Blank, A. Gottberg

Absent : K Hanke, P. Delahaye

Comments on minutes from previous meeting: the yield database must be updated at least once a year.

STAGISO proton beam from PSBooster to ISOLDE (T. Stora on behalf of BE-OP-PSB and TE-ABT):

At present the STAGISO, eg staged bunch extraction from PSB, is limited to 3 rings or ca 2.4 10^{13} ppp, and is exclusively used today for molten metal targets to prevent cavitation and rupture of the beam window. The proposal is to investigate the requirements of the kicker which presently limits STAGISO at 3 out of the 4 rings. This would possibly limit the fatigue on the target units (presently an average proton lifetime is 5e18 proton on Targets (poT) with loss of vacuum integrity while with a cw beam at TRIUMF, 1e20 poT can be reached; Prior to taking any decisions, data on release characteristics and description of the options of the kicker upgrade under investigation should be presented in a forthcoming GUI meeting.

News from RILIS and future plans - Bruce Marsh

Statistics were reported: 116 days of operation; 20 separate runs; 3 dedicated to RILIS physics; >85% of physics schedule; guidelines of operation are documented in EDMS 1722943/1.

The present system comprises 6 pumped lasers, 3 Ti:Sa lasers and 1 powerful green laser for non-resonant ionization.

The regular mode of operation is in normal cavity but suffers from problem in selectivity;

The LIST cavity to suppress impurities is not very much used, mainly lacks of efficiency; at present the use of a FEBIAD cavity works the best.

Many elements have newly become accessible: Eu, Te, Bi with an alternative scheme, Ra beams were ionized with RILIS and delivered to CRIS. Production of Ra^{2+} ions by RILIS has been suggested but not done yet. Finally the development of Se beams is still pending.

At present 3 categories of elements are not accessible for RILIS ionization: those with low Ionization Potential IP as they can easily be surface ionized, those that are not released, and those with a too high IP.

The RILIS efficiency for Te is measured at 18% and yield tests are pending. 3 schemes for Eu are available and need to be tested online. Ra has been ionized twice by CRIS. Schemes for Fe beam developments and first Cr beams were done.

Further to this, topics discussed during (Ion Source and Beam Manipulation) ISBM meetings are the cavities made of amorphous carbon – Sigradur® - and an inverted line polarity. Online tests are foreseen but so far the mechanical coupling of the Sigradur® cavity is too fragile.

VADLIS: has been working well that far, with Mg ionized this year in a SiC-VD5 unit.

Several questions are pending, such as whether the emittance is better in this mode, and if the cavity can be optimized for the RILIS mode. A proposal is to use a pulsed anode and break up in the cavity itself.
In terms of resources, the dye laser will be replaced in 2017, and funding will be requested for the Blaze lasers.
To ease the developments, bipolar power supplies would be beneficial to easily switch to negative beams. The merging switchyard should be triggered in a ppm mode to allow working with the two separators simultaneously. This is already a request made to TE-EPC. A new fellow has been hired to work on the Offline 2 separator, wand should aim to be completed by end of 2017.
Developments are ongoing in JOGU university in Mainz: new LIST, the TOF-LIS.
At TRIUMF, the LIST operated there claims much higher efficiencies, but this may be the result of how this is computed (one cannot compare in cavity vs in LIST mode with the same unit). 1e3 ^{20}Mg clean beams were obtained.
A fellow has been requested to support the RILIS activities. Finally, discussion took place on laser characteristics to perform laser molecular break-up, with ns pulse length desired. K. Flanagan mentioned that lasers with ps length are already available for this purpose.
Finally the RILIS laser spot reflected from the Isolde units will be displayed on a TV screen in the Isolde Control Room.

The GUI committee recommends to come up with a clear list of possible developments and assign priorities and timeline. From them the ToF-LIST project seems to be the most promising.

Preliminary test of the new tape station – Where do we stand ? – Tim Giles

Tim provided an oral report on the advancement of the project: Mechanics is installed and aligned in LA2; it works well; the vacuum pumping was slow but now it is working also as expected. the electronics is not yet synchronized with the PSBooster trigger. The related beam instrumentation with a new scanner and Faraday Cup have been tested with beam. The tape station is equipped with a segmented collimator : the read out electronics is not yet ready. When the beam is centered, 100% of beam could be sent onto the tape.
So far, with radioactive beam, detectors give too much noise; there was however some uncertainty with the beam; noise probably originated from the feedback from pulse counting. The pre-amplificator and discriminators are being build a second time. New tests with radioactive ion beam are foreseen again in 2016 and 2017. Some more work is to be done with controls; the timing electronics will be finished soon; finally the set-up of the advanced measurement features and of the console application needs to be done.
A technical student has been hired to work on the graphical interface. To continue with tests in 2017, R. Catherall requests that the new tape station remains in LA2. K. Johnston mentions it is possible since LA1 and LA2 beam lines are not oversubscribed for 2017.
In conclusion, tests to compare with the old tape station need to be done as soon as possible.
Following up on the topics of beam test activities, B. Marsh is inquiring on the status of the ISOLDE MR-ToF. M. Borge replies part of an applied fellow position is supported by the H2020 ENSAR2 I3, and that there are plans to request a CERN applied fellow position. The project is done in collaboration with S. Malbrunot; MR-TOF systems are commercially available, those inspired from the “Greifswald design” are known to be operational. K. Flanagan confirms that

a number of companies do provide existing devices with about 1e5 mass resolving power. A particular emphasis should be taken to define the appropriate MR-TOF system for the ISOLDE system.

Nanostructure targets production – Thierry Stora

The development and tests of nanostructured targets has been done at CERN-ISOLDE a long time ago. The development of the nanostructured uranium targets took place within the ActILab WP8 Work Package in FP7-ENSAR. Online tests took place both at CERN showing constant and improved yields for a number of radioactive ion beams at ISOLDE from the UC525 unit. The drawback is that the present production process takes up to 4 weeks for 2 people. The proposal was made at the last GUI meeting to improve the process and reduce it to 1 week. This notably included changing the isopropanol solvent used to disperse and grind down the UO_2 powder with water and polymeric dispersant. The volume of the suspension and time to obtain a dry residue was significantly reduced, resulting in 1L of suspension and 1 day. The subsequent grinding of the dry residue resulted in agglomerates that could be pressed into pellets in a semi-automatic mode. Reactive sintering of the pressed pellets took place within 48h. However, at the last step where the nanoUCx charge was to be transferred from its reaction oven to the final production unit, the graphite tube holding the nanoUCx charge was found broken and some pellets dropped and underwent rapid exothermic oxidation. This incident resulted in a request from CERN to perform a full risk analysis and take appropriate measures to resume the production and use of nanostructured target materials. Guidance is provided by HSE to come up with the required upgrades, such as the acquisition of a glove box and eventually a reorganization of the laboratory with a dedicated production room. A disposal pathways must also be considered. The standard UCx can still be produced. B. Marsh inquired if the production could take place outside of CERN. The most important question remains on how the needs for production can possibly be fulfilled before LS2.

Update of yields database – Jochen Ballof

J. Ballof has taken over the task from T. Mendonca. The main components required to update the database are the SQL database itself, the data, the user interface and the logics/structure of the database itself. Upon the move of the Isolde webpage to the Drupal framework, many functionalities were lost. Some were recovered already. As a first step, the requirements were again analyzed. A new design is implemented, in a Microsoft IIS environment, with a dynamic interface, and a restored graphics not managed by Oracle. On the new features, yields can be extrapolated and in-target production are already calculated. Other new capabilities will be the documentation of the impurities in the beam, logbook entries, how the yields are estimated (beta, Collaps, MR TOF, IDS, windmill). Numbers will be pushed as raw or evaluated ones, with typical one month for proper evaluation. Still remains to recover the TARGISOL database.

Recent beam requests and pending cases – K. Johnston

An overview of the 2016 run was given:

Cr beam : went well (63Cr)
Cu run : 78Cu
Ni : 69,71Ni : day after big power cut that may have impaired its graphite lining – 70 Ni was done
N16 from CaO : good yields were obtained.
Ta target run for medical radioisotopes: good yields here with no decay at all; target unit even used a 2nd time successfully.
64Ge from ZrO target – Sulfur from mass marker had impaired the 70SeCO initial physics plans.
Mn from Mossbauer
In suffered 133In
Ba : not so good
At negative run –
Bi run went well, operated very hot (178Bi)
Hg beams from molten Pb (very intense, emittance not so good)
8B charge breeding was demonstrated for REX
Radium in CRIS – RILIS & development
Cd was problematic : could not get to 132Cd, but could get 129Cd;
Sn for HIE-ISOLDE : very good yields
142Xe : difficult to know; yields seem to be good
Fr/Ra suppression tests on warm quartz
UC 132Sn + S during EURISOL DF week
9Li run
66Ni run
The LIEBE online tests cannot happen this year

5 targets developed a leak :
UC563 : 5e18 poT
UC569 : 6e18 poT
UC572 : 5e18 poT
UC579 : 6e18 poT
UC573 : 5e18 poT
It is to be noted that the average lifetime of a target is 5e18poT, these numbers are therefore not very surprising, although it is expected that units can last of up to 1e19 poT.

On INTC 14th Nov, new requests were received:
The development of Ac RILIS scheme.
From previous INTC : 146Gd as 146GdO from Ta565
15C as 15CO 1.5e5/uC
52K, 53K for CRIS
Miniball : 68-70Ni region
Yield tests 146Ce, 148CeO
98-100Kr : nanoUCx specially required
76Cu 2000/s 77Cu: 200/s 78 20/s
COLLAPS: 65-76Ge
58Zn, 56Cu : nano Y2O3

Po in source with LIST
From pending cases, the following were identified:
70SeCO beams for HIE – ISOLDE
Te : beams : yields need to be tested.
Discussions on LIEBE for operation in 2017 (operation review, ALARA) took place
Negative ion sources : status of the tubular cavities
The sigradur progress

Outstanding questions remain: nanostructured targets and the new tape station.
It seems that the emittance of beams on GPS are not very good. Checks on the extraction electrode should be performed.

Physics in 2017 will start 24th April – up to 27th November

AOB :
It was proposed to include a topics on how to make ISOLDE more multi users to be discussed in forthcoming meetings, together with plans for the beam line realignments or rearrangements (?).

Minutes by T. Stora.