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Beam development strategy for providing RIB to M-H and H priority approved experiment by the EEC

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TRIUMF

Ion Source development

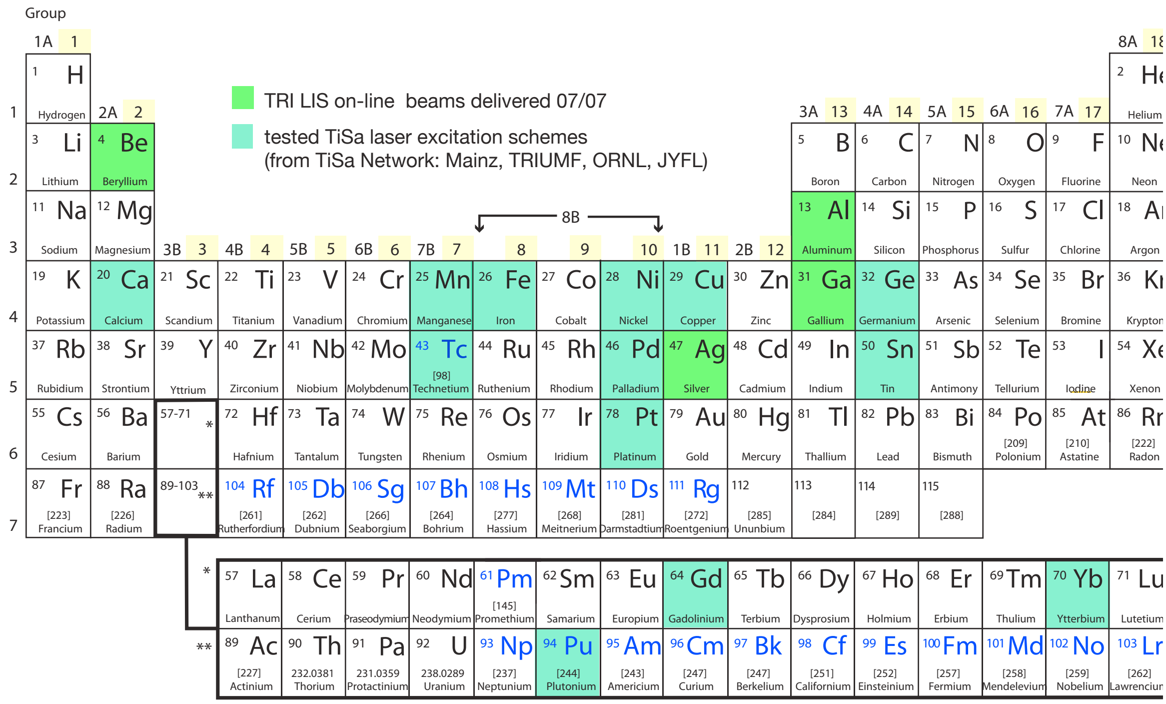
RILIS

In principle the resonant ionization laser ion source can provide pure beam. In practice this is not the case mainly due to contamination from the hot surface ionization. It is very difficult to avoid the production of the surface ions since to obtain good release efficiency the target and transfer tube have to be at high temperature. We can try to change the transfer tube surface by replacing the Ta by a material with a low work function such as LaB_6. Unfortunately, this type of material is not very stable and consequently not reliable. We are developing a RFQ-RILIS for light elements, A< 30, (Jean-Phillipe Lavoie thesis project). The working principle is the following the vapor from the target oven enter a short segmented RFQ, counter propagating laser beams will resonantly laser ionized the desired elements. Once a ion if formed into the RFQ it is capture by the RFQ and a small electric field created by the segmentation of the rods provide enough push to drive the ion out of the RFQ. The simulations show that we can expect an efficiency of the order of 70%. A repeller electrode biased at positive voltage repelled the ions created on the hot surface preventing them to enter the RFQ. A prototype of the RFQ is being built presently. In order to perform the approval test we need the LIS test stand.

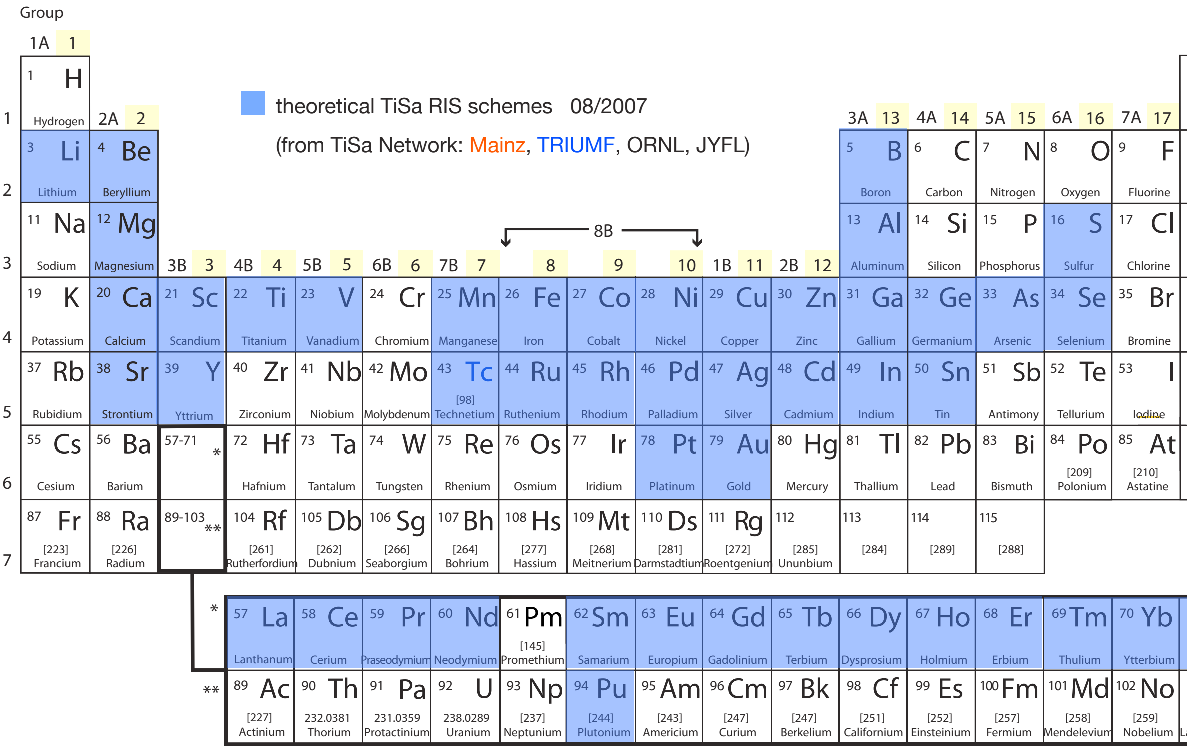
Fall 2007 completion and use of LIS test stand for LIS scheme development and RFQ LIS development.

Winter 2008 and on, RILIS in source spectroscopy (heavy elements; isomer separation, HFS studies)

Winter 2008 and on, RILIS excitation schemes & continuing operation improvements, and RILIS tests on rare earth elements continued



Status of TRILIS elements that have been provided using TiSa based RILIS at TRIUMF or would be ready to go - provided the target chemistry can be handled.



Status of TiSa based RILIS excitation scheme development. There will be a joint development run (Mainz, TRIUMF, ORNL) on testing a number of lanthanide laser excitation schemes in Oct. 2007.

FEBIAD

A new FEBIAD ion source with improved cooling of the Boron Nitrite insulator, a new grid that is more durable and a radiation hard magnet coil, is being installed for a development run in November 2007. Depending on the result of the next november FEBIAD tests we will know the ion source ionization efficiency on-line for several gas elements.

Targets in combination with the FEBIAD ion source we would like to test are the ZrC/ $C_{graphite}$, Ta and Nb.

ECR ion source

The ECRIS prototype is fabricated (thesis project of Francis Labrecque), and tests to measure the ionization efficiency and the emittance will commence in October. The goals are to finalized the acceptance tests for the summer 2008 and than give the engineer the detailed specifications for implantation into the target module. Purchase the required power supplies for the coils and the RF. Installation into the Faraday cage and implantation into the target module will take 6 to 9 months if we can have a priority number 1. Otherwise, it can take 3 years to have the ECRIS on-line.

Charge state booster

The charge state booster is being tested presently. The plan is to have it installed after the mass separator in the cave during the winter shut-down. The results obtained at the ISAC test stand are 5% for noble gases and 2-3% for condensable elements. The vacuum boxes in the LEBT are being upgraded by replacing the o-ring on the lids.

OLIS

The off-line ion source (OLIS) is being upgraded presently. The SUPERNANOGAN ion source installation should be completed in November 2007 depending on the man power and funding availability. In principle we will be able to provide a vast inventory of beam for experiments and for pilot beams for the LINAC tuning.

Polarizer

The polarizer has been upgraded in preparation for the delivery of ^{11}Be beam to bNMR. New coils were fabricated and installed and lasers have been upgrade to provide the required laser beams (Richard Labbé thesis project with the help of Phil Levy).

Target development

Release study required

To release of 26mAl and 25Al isotopes we must find a target that can release these isotopes much faster than our usual SiC/$C_{graphite}$.

As

A potential target for this study is ZrC/$C_{graphite}$ with a FEBIAD.

Ru and Rh

A potential target for this study is ZrC/$C_{graphite}$ with a FEBIAD.

30P

We must find a target candidate and study the effusion of the P.

Sc

A potential target for this study is ZrC/$C_{graphite}$ with a FEBIAD.

^{14,15}O, ^{17}N and ^{11}C beams

C, N and O can not be produced in large amount using a FEBIAD ion source. The reason being that these elements react with the hot tantalum and they produced very refractory compounds, TaC, TaN and TaO. We may produce enough for low intensity experiment like for the super allowed Fermi transition and for the OSAKA experiment.

But, in order to obtain the requested C, N,O beams intensity for the nuclear astrophysics program we need to find a target that can release oxygen. But before we try anything we need an ion source that can ionize the oxygen. The only ion source that can ionize oxygen with high efficiency is an ECR ion source.

An ECR ion source (MISTIC) prototype is being assembled in the moment and we will have the first test off-line during the fall 2007

^{17,18,19}Ne

We may produce enough 18Ne for the superallowed experiment using the FEBIAD ion source with a $SiC/C_{graphite}$ but for nuclear astrophysics program it will be better to use an oxide target. Development of an oxide target for ISAC is being envisaged in collaboration with CERN/ISOLDE.

We are planning to have an Al_2O_3 target ready for test on-line during spring 2008.

^{34}Ar

Here again we can benefit from the use of an oxide target since the release of Ar is much faster than the using carbide target.

Sr

Sr beam can be developed using a ZrC/gr target and a FEBIAD ion source or surface ionization + fluorination.