



Beam lines realignment: history based on ISCC minutes

Gerda Neyens



68th ISCC meeting, 23 Oct. 2013

The committee is informed by R. Catherall that the beam alignment survey has shown a 10mm vertical step in the center of the beamline (CB0) while there is an overall **vertical difference of 17mm between the target ion source and ISOLTRAP (CD0)** in level

but it has been decided not to realign the beamline during LS1 for several reasons including the current heavy workload at ISOLDE, the clash with HIE-ISOLDE work in the hall and the uncertainty in improvement of beam transport.

The committee states that the realignment must be addressed **and requests that a project be undertaken to produce a simulation of the beam improvement if the beamline is realigned.**

71st ISCC Meeting, November 2014

Beam Optics Studies of the ISOLDE beam lines with MADX (E. Rapisarda)

The most recent survey, carried out in 2013, showed significant misalignments of the ISOLDE beamlines. It was **not clear what the impact of this misalignment would be on the beam transport to the experiments** and therefore **if the beam line should be realigned.**

Hence an acceptance study of the ISOLDE beamlines has been carried out using MADX, a software for particle accelerator simulations based on transfer matrix formalism.

E. Rapisarda presents the results of this study and **concludes that a reliable model of the ISOLDE beamlines can be achieved using MADX and that horizontal trajectory distortions generated by the misalignment can be corrected with the steerers; vertical trajectory distortions are still under analysis but the misalignment is less pronounced.**

74th ISCC meeting, November 2015

Technical news, initiatives for the coming shutdown and TISD Activities

Thierry Stora (CERN) Replacing Richard Catherall

A work request for the realignment of all the beam lines at ISOLDE has been submitted to the PLAN office **pending the approval from the ISCC.**

- HERE it is stated for the first time that the re-alignment might be done (pending approval of ISCC).
- At this moment, the **further requested studies** on what is the impact of the vertical distortions on the beam transmission and how much can be gained if realignment would be done, **seems not to have continued**

75th ISCC meeting, February 2016

Realignment of the beam lines *Richard Catherall*

The committee is reminded about the beam alignment survey that was carried out at ISOLDE in 2012 and that a 10mm vertical jump was detected which affects beam transport.

E. Rapisarda completed a theoretical beam transport study in 2015 and found that the **steerers could cope with the 10mm step** but that they were working at their limit.

The committee is told that the 10mm vertical step should be removed but that it still had to be decided if the height of the beam line should have a gradual increase or if it should be made flat.

L. Schweikhard comments that any changes to the beamline could cause a problem for ISOLTRAP. The issue would be discussed at the upcoming ISOLTRAP collaboration meeting.

R. Catherall will look into the possibility of using two steerers in order to overcome beam transport losses where the jump occurs.

→ All this seems to be decided without details on what is the current transmission into the different beam lines, nor how much transmission gain can be expected

76th ISCC meeting, June 2016

Realignment of the beamlines *Richard Catherall*

The committee is briefly reminded of the results of the survey of the ISOLDE beam lines performed at the end of 2012, which found a 10mm vertical step after the main switchyard on LA1, as well as the MADX simulations made by E. Rapisarda in 2015. R.

Catherall tells the committee that realignment of the beam should cost about 30kCHF **but will, of course, affect experimental setups depending on whether the height of the beamline is made flat or with a gradual increase.**

After a discussion, the committee agrees that the beam realignment should go ahead but **requests that first ISOLTRAP, which is the experiment that will be most affected, reports at the next ISCC meeting on the work and manpower required to adjust the setup for the realigned beam.**

→ Other beam lines are also affected, but they have not officially commented through their representative !

77th meeting, November 2016

ISOLTRAP: Impact of the realignment of the beam lines, final decision

Richard Catherall

ISOLTRAP constraints and the modifications that would be required if the ISOLDE beam lines are realigned are presented. **The committee is informed that the ISOLTRAP collaboration agrees to take the required action but requests support, both manpower and financial, for the necessary modifications and beam realignment. R. Catherall agrees that EN-STI-RBS will provide this support.**

The committee approves the beam realignment project. The ISOLDE technical group and V. Manea are thanked for their efforts regarding this issue.

What I am missing

- What is the current transmission efficiency into the different ISOLDE beam lines ?
- What will be gained by re-aligning the beam lines in terms of transmission to each of the experiments ?
- A detailed plan of what exactly will be aligned and in what way this will be done (manpower, also for the users beam lines, what needs to be done for which beam line, estimated time and planning – users impact !)
- None of these has been discussed and should be discussed before we can make a well-motivated decision.

USERS INPUT (collected by Karl)

- **SSP (GLM/GHM/LA1/LA2):** no real issues reported (GLM and GHM are not in the re-alignment zone anyway; no serious issues for LA1). LA2 hasn't too much recent data: but the last few tests to the tape station were ok for Tim; nothing dramatic noted.
 - **COLLAPS (mostly using HRS+RFQ):**
 - From GPS or after RFQ on HRS they report **100%**. Strong preference to **not realign beamlines**
 - **More of an issue is the transmission through the RFQ** (data from 2017):
 - 25/10: Rb, 50 kV, 57%
 - 26/10: Sn, 50 kV, 60%
 - 06/09: 39K, 40 kV, 68%
 - 31/05: 39K, 30 kV, 68%
 - 31/05: 23Na, 30 kV, 61%
 - 31/05: 27Al, 30 kV, 61.5%
- On average, the transmission is of the order of 60% through the RFQ

USERS INPUT (collected by Karl)

● CRIS (only using HRS+RFQ):

- Transmission from RFQ into beamline is around 80-90%
- **Transmission through cooler is very low (FC690 to FC748):**
 - 4/5: 115In, 40 kV, 50% (then 90% to CRIS unsuppressed FC)
 - 12/6: 39K, 40kV, 50%
 - 5/10: 80Ga, 40kV, 35% (then 77% to CRIS unsuppressed FC)
 - 5/10: 39K, 40kV, 47%

● ISOLTRAP (using GPS or HRS+RFQ):

- Would be **very happy not to have a re-alignment** campaign. Their tunes are satisfactory and the extra work required to facilitate realignment would be very heavy on the collaboration.
- Transmission through cooler is sometimes a problem (numbers for 2016-2017):

USERS INPUT (collected by Karl)

IDS:

- **Typical transmission: 60-80% from GPS to the chamber.** Transmission worse for low energy beams and dependent on ion source (which is usual). Tuning times can be long, especially when autotune is not working.
- **Quite some losses at the switchyard feeding IDS/NICOLE.** This is being looked at locally; supports require re-doing.
- **Many issues with mass factor on GPS.** IDS seems to be the most sensitive to this; hasn't been such a problem for LA1 e.g. during same beamtime: perhaps some elements going to IDS are more sensitive to this.

USERS INPUT (collected by Karl)

● VITO :

- Magda reports essentially **100% transmission from RFQ to the beginning of VITO**; ~50% through their own beamline. They prefer no realignment of the beamlines.

● NICOLE:

- Difficult tune (same switchyard as IDS). No recent runs, but tunes used to take a long time (before autotune era).

Summary:

- none of the user groups is in favor for a realignment of the beam lines
- several groups using HRS+RFQ report a **rather low transmission through RFQ**
- Difficult tuning at the switchyard towards IDS / Nicole
- Mass factor of GPS is a problem
- **Autotune is important** for all !