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DELIVERABLE D5.2

IonLab running as ISE

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EXECUTIVE SUMMARY

During the previous CINCH projects, so-called RoboLabs were developed, experiments that are set up in radionuclide laboratories and can be operated by remote control from anywhere in the world. The user does not have to enter the controlled area and can obtain his own measurement results remotely. The disadvantage of these RoboLabs are that only one user can access the experiment at a time and the maintenance effort is quite high. To overcome these problems and to create a sustainable solution, a so-called interactive screen experiment (ISE) was developed from the RoboLab IonLab.
In the IonLab, users can perform a chromatographic separation of Strontium and Yttrium and measure the success of the separation with a Geiger-Müller counting tube. The user interface of the ISE is based on that of the actual RoboLab-experiment, but unlike the real experiment, a recording is played instead of live video and the data is programmed by software the experiment is suitable for pupils and students and the respective user manuals were revised and adapted to the ISE.

The ISE can be accessed via this link: http://ibe.irs.uni-hannover.de/ibes/en/RoboLabs/IonLab.html

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1 INTRODUCTION

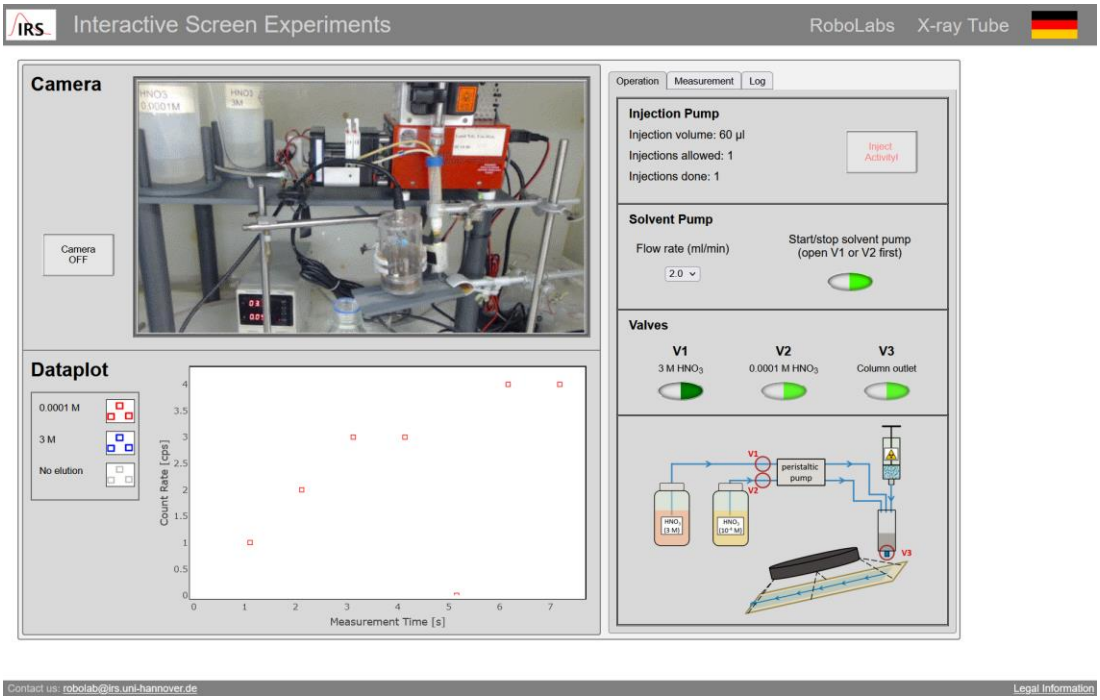
In the education of young scientists, online experiments can never replace real experiences in the laboratory, but used wisely, they can be an enriching addition. Especially if young people are to be inspired by science, it is important that they can experiment themselves and are thus introduced to the subject in a playful way. However, since underage students cannot actively work with radioactivity in the control area and not all universities have appropriate laboratories for radiochemistry training, RoboLabs were developed as part of the previous CINCH projects, which allow users to remotely operate experiments in the control area and obtain their own measurement results. The IonLab, which deals with chromatographic separation of strontium and yttrium, was tested in school classes during MEET-CINCH and was able to inspire the pupils. However, the experiment was considered to be operated by only one user, while the rest of the class could only watch this. To overcome this problem, a so-called interactive screen experiment (ISE) based on IonLab was developed. The ISE has the same user interface as the real experiment with the advantage that any number of users can access it simultaneously. If the experiment is now to be carried out in a school class, the real experiment can be shown first as a demonstration. When pupils see that they can move things around in the real lab, this demonstrably increases motivation for a virtual experiment. The ISE can then be used so that everyone can do their own experiments afterwards.

2 THE INTERACTIVE SCREEN EXPERIMENT (ISE)

The ISE can be accessed via the IRS ISE portal following link. Currently there are two ISEs to choose from: GammaLab and IonLab. PAuLa will be added soon:
http://ibe.irs.unihannover.de/ibes/en/RoboLabs/index.html

The user interface of the IonLab is shown in figure 1. The first screenshot is taken from the ISE, the second from the original RoboLab.

ISE:



RoboLab:

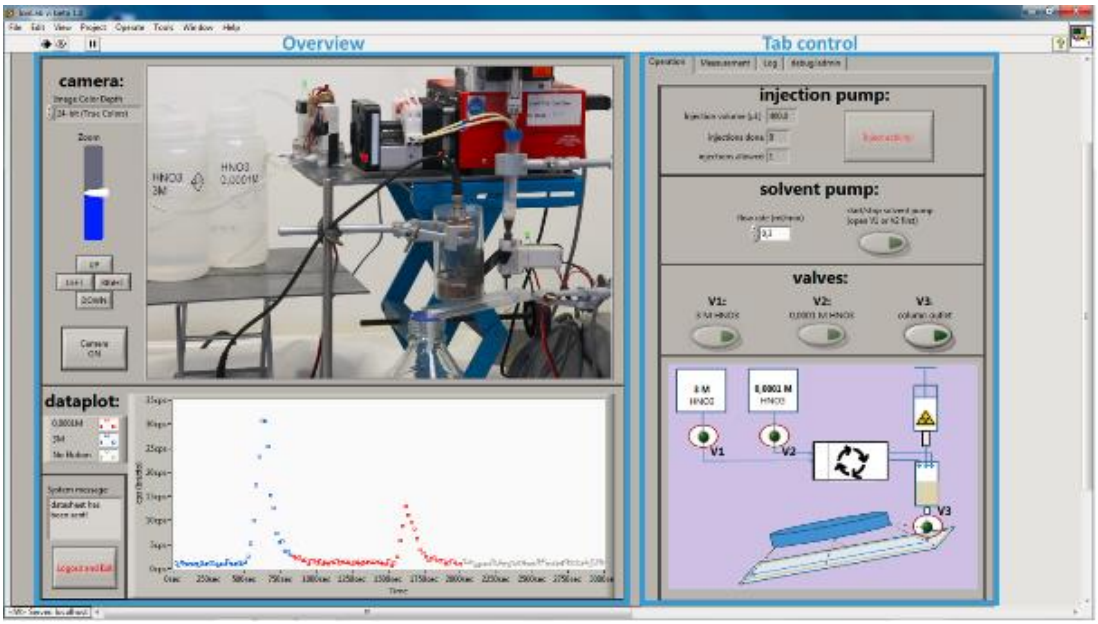


Figure 1 The user interface of the ISE was designed with the controls of the actual RoboLab in mind, so that the students can easily use both of them effectively. The existing revised materials (see MEET-CINCH D2.8) can be used for preparation and evaluation of the experiment.

Since both interfaces are very similar, it can be assumed that the experiences made by the users can be transferred very well from one experiment to the other. In this way, the actual RoboLab

can be used to explain what needs to be done and what is important, and can be immediately imitated by the students or pupils. The users will feel conected to the real experiment, even if they do not work with the robot themeselves. All functions of the RoboLab found their way into the ISE: It is possible to control the three valves, the pumps and decide on a flow rate. The measurement works the same, with real measured values stored for the different parameters. There is also the possibility to comment and download the automated log and data.

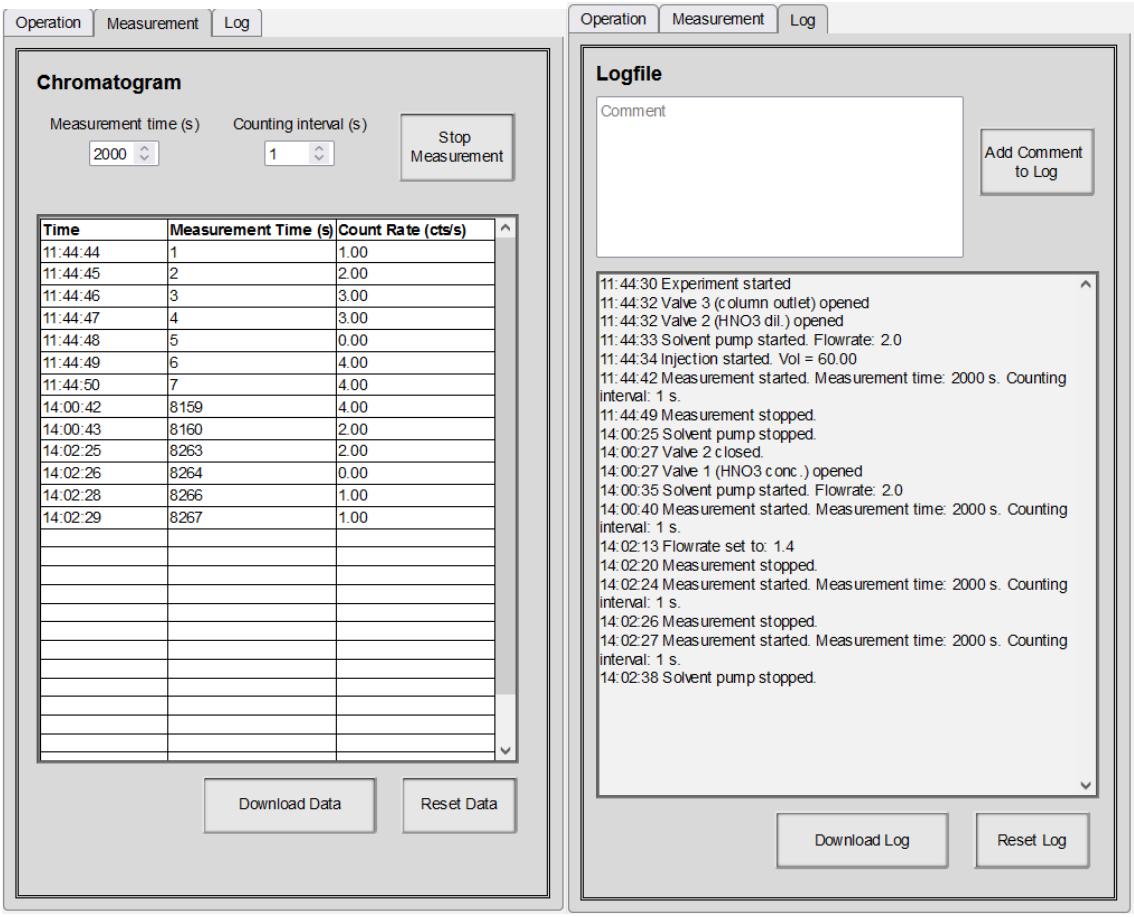


Figure 2 Next to the operation tab are the options for the measurement and the automated log, which also can be commented. Both data and log can be downloaded as well.

2.1 Benefits of using an ISE

The most direct advantage of the ISE is that more people can perform the experiment at the same time. Where before the course or the class had to watch one demonstration, everybody can go through the experiment at their own pace and with their own parameters.

The second main advantage is, that the experiment is easy to reset this way. If one set of flow rate, measurement time and intervals was used, the web page can be reloaded and the experiment starts all over again - this time with new parameters. This leads to a heightened sense of trial and error which can be very inspiring for the pupils.

In addition, the experiment can be carried out very flexibly in terms of time. Whereas in the real experiment it was necessary to make arrangements with the RoboLab supervisors on site to support the log-in process or to help with any technical problems that might arise, the ISE can be used by any number of people at any time. This in turn increases the possibilities for use - whether as a brief supplement to already taught content or as a completely new independent experiment.

In addition, the ISE ensures the availability of the experiment over a long period of time, since no resources for the maintenance of the equipment and no supporting personnel are needed to perform the experiment. It can also be used as a transitional substitution for practical courses if the laboratory cannot be used due to e.g. reconstruction measures. In the Covid-19 lockdown, it was used at LUH as part of a digital lab course.

The ISE was tested by the NNL. One minor defect was detected and later corrected.

3 CONCLUSIONS

The newly made ISE for the IonLab works very well and allows a larger number of students to carry out the experiment. Since the ISE was developed very close to the RoboLab, all the learning outcomes defined for the real RoboLab can be achieved in exactly the same way. If in addition the RoboLab is used as a showcase, the combination of both (real and virtual) experiments will let the users feel connected to the real experimental setup and at the same time give them the possibility to perform the experiment completely by themselves. In addition, the quick reset option also invites users to try out different parameters. Thus, users can use different flow rates, measurement times and intervals.

Additionally, the ISE represents a long-lasting solution, since the ISE does not require maintenance. Should the RoboLab become unsupported at some point, students from all over the world can still perform the interactive screen experiment at any given time and access the materials available.