Instructions for External Users to prepare Beamtimes at PHELIX

Congratulations! Your beamtime proposal has been accepted and we would like to guide you through the process of preparing the beamtime at PHELIX.

Important Information

There are a few important things that one has to bear in mind and that could be different from practices from other laboratories. These are covered here.

Restriction on the number of users

Based on our experience, PHELIX only trains and hosts 6 official users at a time. Such users are getting badges for full 24/7 access to our premises together with personal safety equipment and the necessary training to be independent around the laboratory. Because the working space is tight in the laboratory and such procedure costs time and money, we limit the number of users to 6. Exceptions can be made provided a motivated application is made no later than on the TDR.

Access to the laboratory during experiments

The laboratory and target areas are normally declared a “controlled area” as soon as on-target intensities exceed or could risk exceeding \(10^{18}\) W/cm\(^2\). That means personnel access restrictions following the GSI safety regulation apply for PHELIX. Please check the relevant information on:

https://www.gsi.de/en/start/about_us/gsi_abteilungen/stabsstellen/strahlenschutz/zugangsvoraussetzungen_zu_kontrollbereichen.htm

Working hours/shifts

In general users doing stand alone experiments will receive support Monday through Friday from 9:00 to 18:00. Target shots are in principle available during these hours. Alignment using the front end (10 Hz) or a Nd:YLF (cw) alignment laser (not available on the Z6 10-degree Beamline) can be done during this time, too. Operation of the front end is not foreseen outside of these hours.

Users working with the UNILAC can expect support between 6:00 and 23:00.

Application to work with the alignment lasers outside working hours should be made in advance and we will try to accommodate them through proper training of the experimentalists. They will in general not be granted when made at the last minute.

Beamtime organization

The following is a list of the key protagonists which interact before and during the experiment. It also states their duties

- **Principal Investigator (PI)**: this is the person who submitted the proposal. His or her main duty is to organize the experiment from the conceptual design side. This means:
  - To prepare and hold a technical design report/review **at least 2 months before the experiment starts**. The requirements to be fulfilled by the review are covered below,
  - To write and distribute the review minutes,
Preparing the list people participating to the experiment and communicating it to GSI.

- **Link Scientist (LS):** this person is responsible for the coordination of experiments including the PHELIX laser. His tasks include the following:
  - Responsibility for the target area’s technical equipment
  - Contact with the experimental group during the preparation of the beam-time
    - Safety training / safety regulations
    - Travel/lodging possibilities
    - Act as technical contact before the TDR
  - At the beginning of the experiment setup time
    - Host the guests (short introduction to the experimental facilities), computer registration etc.
    - Do the user training (vacuum cycle, target change, motor controls, safety, alignment laser shutdown procedure, if necessary)
  - During the experiment:
    - Introduce users to the established shot procedure
    - Support users with readily available equipment, coordinate access to additional resources

- **The experiment coordinator (EC).** This person implements the experiment and executes the experiment plan alone or with the experimental team. His or her duties are the following:
  - The EC must plan to meet with the SD at the beginning of every shift to discuss the shot plan for the day.
  - The EC is responsible for coordinating the activities of the experimental staff.
  - The EC orders the shots from the laser. Nobody else is allowed to do so.

In general, ECs cannot do two or more shifts in a row. An EC must also be capable of making decision concerning the experiment during his shift.

- **The shot director (SD).** The shot director is organizing the shot sequence from the laser side in coordination with the EC. He can be reached via the internal phone number 2000 at any time during the beamtime. Shot directors are changed at every shift.

- **Target area responsible person:** This person coordinates target area relevant work and provides local instructions regarding operation and safety.
  - Target area Z6 in the UNILAC hall: Abel Blazevic a.blazevic(at)gsi.de
  - Petawatt target area: Bernhard Zielbauer b.zielbauer(at)gsi.de
  - X-ray laboratory: Bernhard Zielbauer b.zielbauer(at)gsi.de

### Organizing your trip to GSI

#### 1. Complying with safety requirements

Detailed instruction about the general policy of GSI concerning safety can be found at http://www.gsi.de/informationen/departments/sist/allgemein/fremdfirmen/index_e.html

People planning to participate in experiments at PHELIX must fulfill the following requirements:

- Provide a radiation safety passport that shows that they are under a radiation safety program within their home institution. Please inquire ahead of time if this cannot be done. For details and to find out whether this is required, try early to contact the LS.
Undergo the general safety, laser safety and – if required – the radiation protection safety trainings of GSI. This training takes place in form of a slide show followed by multiple choice questionnaire available online which can be found at the URL given above (including details how to access). This should be done before you come to GSI.

Finally a local instruction has to be undertaken after you arrived at Darmstadt. Get in contact with the LS about details.

2. Technical design review (TDR)

The following table shows the different points which must be covered during the technical design review. The beamtime can be postponed or canceled when the design review fails to answer each point. All technical and organizational questions need to be clarified before the TDR with the responsible persons. The TDR is implemented to formalize the acknowledgement of the experiment’s requirements.

<table>
<thead>
<tr>
<th>Point to be covered</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical aspects</td>
<td></td>
</tr>
<tr>
<td>Statement about goals</td>
<td>The final goal must be in line with the proposal. The experiment should be structured into steps/ milestone results if possible.</td>
</tr>
<tr>
<td>Experiment setup review</td>
<td>A drawing of the target chamber with all foreseen diagnostics should show the feasibility of the experimental layout and requirements from the PHELIX side. Implementation of major changes to these requirements need to be discussed with the responsible persons and cannot be taken for granted.</td>
</tr>
<tr>
<td>List of diagnostics to be used</td>
<td>Source of and responsibility for the diagnostics and infrastructural requirements should be identified</td>
</tr>
<tr>
<td>Laser parameter review</td>
<td>The PHELIX team will work for making the parameters from the laser which have been agreed on at the TDR available at the time of the experiment</td>
</tr>
<tr>
<td>Organization aspects</td>
<td></td>
</tr>
<tr>
<td>Finalize dates, number of shifts</td>
<td></td>
</tr>
<tr>
<td>Name the EC (ECs) for the experiment</td>
<td>The EC on duty needs to be communicated to the shot director at each shift</td>
</tr>
<tr>
<td>List all participants for access authorization</td>
<td>People outside this list may not be granted access to the experimental area.</td>
</tr>
<tr>
<td>Address safety issues/shielding plan</td>
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</tbody>
</table>

The design review can be done as is acceptable to all parties. This should preferably be done as a local meeting or a video or telephone conference. A written document is also acceptable, but acceptance from the PHELIX side (possibly after feedback and revision) is required before the beamtime will be scheduled. The following persons need to take part in the review:
Before it really starts

The beamtime typically covers two parts: An implementation phase in which the experiment is set up, and the real beamtime.

Questions to be answered shortly before and which have to be checked on a daily basis

**Implementation**
- who is doing what
- what is required from laser side (timing signals, laser pulses, test shots)
- what has to be done for safety (shielding, inspection by the safety department)
- requirements of material, equipment, network access, space requirements for preparation, setup and storage - preparation phase plan

**Beamtime**
- one or two shifts?
- shotplan
- beamtime plan

**Additional considerations**

We would like to mention some more details which, taken into account early in your preparation, might not mean too much additional effort, but on which we have to insist in order to maintain our operation standards and/or will make it easier for you to make good use of your beamtime:

- We do not allow cardboard boxes in the lab and try to avoid paper whenever possible to maintain our cleanroom environment. So, especially if you plan to bring large amounts of equipment, it will certainly help if this is packed in cleanroom compatible bags (ideally several layers) or containers which can be easily cleaned before bringing them into the laboratory.

- For the same reason (we have to insist on that even in summer time) you can only enter the lab in clothing appropriate for class 100000 cleanrooms which for example excludes shorts.

- Material and diagnostics which are to be installed in or connected to the target chamber vacuum need to meet vacuum standards for 1E-6 mbar. This e.g. includes the use of vacuum compatible lubricants, venting of internal cavities (typically screw holes) and clean or easily cleanable surfaces. Plastics and adhesives have to be chosen with care and should be avoided wherever possible. Please be aware that in the PW target area, as part of the shot sequence, the target chamber vacuum will be directly connected to the compressor chamber where we have an upper limit for shooting of 5E-5 mbar. While the basic setup in the chamber (parabola and focus diagnostics) will allow for a cyclic pump down time of about 30 min, a typical setup in which the above things have been considered will increase this to about 40 min. This time can,
however, be increased a lot if these rules are neglected, which will make it hard to keep up with the laser cycling time of 90 min.

**At the end of beamtime**

**On the last day**

For experiments having used laser intensities above $10^{18}$ W/cm$^2$, a surface contamination test must be done before you are allowed to remove equipment from the target area. The test must be ordered in advance and usually takes 1-2 hours to give results. The test can only be performed during working hours (typically until 18:00). If you want to quickly un-mount your experiment, please plan with the last shot before 16:00 on the last day of experiment and coordinate this with the shot director.