**Ad-hoc Meeting with WP2, WP3 & WP6** to discuss the Target Chamber, Nozzle & Gabor lens.

**LhARA wiki location for documents related to this meeting:** [**here**](https://ccap.hep.ph.ic.ac.uk/trac/wiki/Research/LhARA/DesignAndIntegration/Meetings/2023)

**Present:** Chris Baker, Neil Bliss, Nick Dover, Ross Gray, Clive Hill, Ken Long, Colin Whyte.

**Apologies:** None.

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| **Actions** | **Description** | **Status** |
| 23-04-20-01 | **Ross** to provide the new design of the tape drive being developed. | Complete |
| 23-04-20-02 | **Ross** to provide details of the camera mirror arrangement. | Complete |
| 23-04-20-03 | **WP2** to provide details of the slide accuracy/repeatability specification for moving mirrors M3 and M4 (OAP). | Open |
| 23-05-24-01 | **Clive** to provideColin with the CAD models requested. |  |
| 23-05-24-02 | **Colin** to sketch the Gabor Lens configuration idea proposed to understand if it helps. |  |
| 23-05-24-03 | **Clive** to take on board the comments made by Ross and the points discussed in the meeting to further develop the design options for the target chamber that includes an update to the vertical beam path option similar to SCAPA. |  |
| 23-05-24-04 | **Colin** to organise a face to face meeting at RAL or at Strathclyde. |  |

Clive presented slides, document: **1272-pa1-meng-prs-0007-v1.0 -Target Chamber 23-05-23**

* The slides are an update from the meeting and slides presented on 20th April, document **1272-pa1-meng-prs-0004-v2.0 Target Chamber 2023-04-20** and notes **LhARA WP6 mtg notes & actions v2.0 2023-04-20** [**here**](https://ccap.hep.ph.ic.ac.uk/trac/wiki/Research/LhARA/DesignAndIntegration/Meetings/2023/2023-05-23)
* The new configuration shows the optics is in the horizontal plane rather than the vertical plane and the tape drive in the vertical plane rather than horizontal.
* The camera and beam splitter used to image the back of the target during st-up has been shown vertical rather than horizontal, with the mirror adaptor provided by Ross.
* The OAP to target distance has reduced from 210mm to 165mm (F/1.5).
* The tape drive is shown with the laser beam striking the back of the tape drive rather than the front of the tape drive. This change creates some extra space to help the OAP 165mm (F/1.5) dimension.
* The target to nozzle exit distance reduced from 150mm to 100mm as used in the WP6 beam transport simulations.
* The angle between the input and output of the OAP mirror maintained at 23.1°.
* The vacuum chamber shape modified to provide space for mirror M3.
* The tape drive would require modification to allow the laser beam to be clipped on both the legs before and after the OAP.

Ross presented comments and concerns about the design, document: **1272-pa1-meng-prs-0007-v1.0 -Target Chamber 23-05-23 \_RJG\_comments** :

* Why can’t we follow more or less this (SCAPA) setup and then leave space for the Gabor to be inserted below the final turning mirror before the parabola? Is it because of the Gabor diameter clipping the beam? Is that the case even if the target is rotated at 45 degrees? Slide 2.
* General comment that the tape drive is our initial target arrangement. Longer term we would hopefully opt for a liquid jet type target for continuous operations. Slide 3.
* The first mirrors (M1 & M2) could be at 45 degrees. This helps with initial setup and alignment. Slide 4.
* Generally this arrangement (OAP mirror horizontal beam) gives a very restricted view around the interaction region. Significantly restricts additional diagnostics and reference cameras which aid in alignment and optimisation of the source. Slide 4.
* Why change the overall shape of the chamber rather than using a square chamber with a large diameter port that the Gabor setup could enter through. Slide 4.
* We should include a beam profiler which drives into place when the camera is out. Ideally we would have three positions (1) camera (2) Beam profiler (3) Gabor access. Slide 5.
* XYZ Translation stage needed for the tape drive. Slide 5.
* This setup (laser beam striking the back of the tape drive) excludes the possibility of front surface optical probing which might be needed. Slide 5.
* We may want another (much smaller diameter) 'prepulser' beam line for the front surface. This enables control of the front surface plasma conditions. (Additional optics required). Slide 5.
* The parabola would have a pellicle in front of it to protect from debris. A different parabola mount could be considered. Slide 5.
* For alignment purposes the z (focus direction) of the translation stage should be aligned with the laser axis. The same is true with the tape drive (translation). Slide 10.
* Mitutoyo 50x lens working distance is 25.5 mm... so distance from target to lens has to be that when in focus. Slide 11.
* Typically on the order of 1 um and over 5 cm of travel. The stage which moves the camera out of the way is typically longer (on the order of 25 cm). Slide 13.
* Nick commented that the OAP angle on 23.1° (SCAPA angle) could be reviewed to check if it could be increased to provide additional space.

Options discussed to increase space for the tape drive target, new targets that will be developed of unknown size and geometry, and diagnostics devices between the target and the nozzle that is only 50mm.

* Consider changes to how the gabor lens could be designed to create additional space in the target vacuum chamber. Colin offered to sketch what he had in mind using CAD, similar the what Ken sketched on ZOOM. See figure 1.

**Action 23-05-24-01:** **Clive** to provideColin with the CAD models requested.

**Action 23-05-24-02:** **Colin** to sketch the Gabor Lens configuration idea proposed to understand if it helps.

* As discussed in the previous meeting adopting a design configuration where optics 3 & 4 (OAP) move upstream accurately and repeatable on a precision slide to create the set-up space between the target and the nozzle.

**Action 23-05-24-03: Clive** to take on board the comments made by Ross and the points discussed in the meeting to further develop the design options for the target chamber that includes an update to the vertical beam path option similar to SCAPA.

A face to face meeting was considered to help develop the design.

* Ross is available at RAL on 30th June.
* Clive is not available 5 – 16th June.
* Neil is not available 3 – 7th July.
* Strathclyde could be a good venue to show equipment at SCAPA.

Action: **23-05-24-04: Colin to organise.**

At the meeting is would be useful to draw up a table of motions for the target chamber component parts.

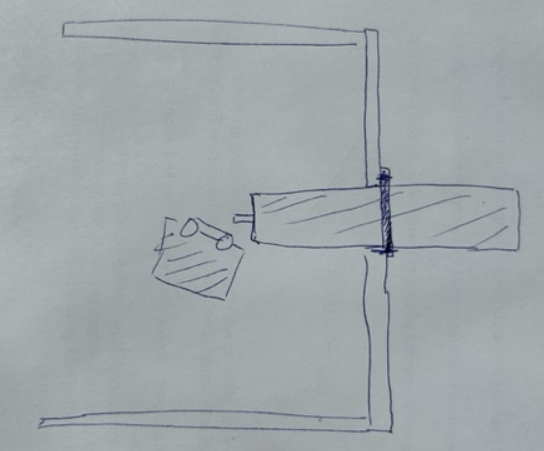


Figure 1 showing the Gabor lens cantilevering into the target chamber

*Neil Bliss, 25th May 2023.*