**LhARA WP6 Meeting**

**Notes and Actions from meeting held on 15th November 2022**

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

**Present:** Neil Bliss, Ajit Kurup, Kenneth Long, Jaroslaw Pasternak, William Shields.

**Apologies:** Hywel Owen, Colin Whyte.

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| **Actions** | **Description** | **Status** |
| 22-11-01-01 | **Will Shields** to provide Excel file with input from Jaroslaw. 1 -2 weeks timescale | In progress |
| 22-11-08-01 | **Neil Bliss** to e-mail ITRF SharePoint link | Complete |
| 22-11-08-02 | **All** return e-mail confirming if you do not have access and access will be implemented. | Complete |
| 22-11-08-03 | **Will Shields** to send the latest BDSIM file he has been working on to Jaroslaw. | Complete |
| 22-11-08-04 | **Will Shields** to explore the capability of GPT Optimisation programme (GDFSOLVE) | In progress |

**Agenda:**

1. Actions from last meeting.
2. Simulations.
   1. Presentation by Will Shields.
   2. Presentation by Jaroslaw Pasternak.
3. Transfer of data between Simulations & CAD.#
4. A.O.B.

**1. Actions**

Actions table updated above.

Will reported on update on the automation of the Excel file creation based on BDSIM, everything is ready to go.

Jaroslaw reported on the proposed baseline updates: removal of the Octupole 1, correcting placement of the Energy Collimator for Phase 1 (at z=5.753m), addition of the Energy Collimator for Phase 2 (at z=5.95m), new setting of the GLs for the Phase 2 with the pre CDR beam compatible with the position of the Energy Collimator for phase 2, correction in the focusing strength of the GL5.

Ajit mentioned that the RF cavities are not simulated in the Phase 1 and that there is a clear need to demonstrate their functionality and establishing their parameters. All agreed.

**2. Simulation & Geometry Update**

**Presentation by Will Shields** document: [20221115\_WShields](https://ccap.hep.ph.ic.ac.uk/trac/attachment/wiki/Research/DesignStudy/DesignAndIntegration/Meetings/2022/2022-11-15/20221115_WShields.pdf)

**Work completed:**

* **AP**: Automatic Excel survey generation - model passed to Jaroslaw Pasternak for checking
* **AP**: Models updated
  + Main baseline design: V4.4
  + Alternative baseline design: V5.4

**In Progress:**

* Update model components to match naming convention (SharePoint ✓)
* CAD conversion testing
* **AP**: GPT optimisation of capture section - gdfsolve
  + Model: LhARA capture section + drift (RF / wall). Kept ideal beam for testing.
  + Sensitive to choice of variable limits, constraint values, tolerances, etc
    - No solution – no output
  + Optimisation tests with space charge ongoing
    - Possible solution found for GL1 field: 1.4387 -> 1.466
    - Checking (optics, GL voltage, etc ….)
  + Lesson learnt: **DO NOT** call your batch script gdfsolve.bat – infinite loop.

**To do:**

* Identify locations for non-beam transport systems + add to mode

**Presentation by Jaroslaw Pasternak** document: [Capture \_Space\_issues15112022](https://ccap.hep.ph.ic.ac.uk/trac/wiki/Research/DesignStudy/DesignAndIntegration/Meetings/2022/2022-11-15#no1)

Jaroslaw reported on the meeting with the capture group (in the morning of the same day), where it was proposed to keep the baseline of the capture system (the first two GLs (Gabor Lenses) coupled to the target system) unchanged. The filling of both GL1 and GL2 is planned to be performed using the movable electron source on-axis, from the downstream direction from the drift between GL2 and GL3. It is hoped that the plasma will be stable for at least a day or more so the electron source could be removed for the proton operations. The space for vacuum pumps coupling for GL1 on the side of the target vessel seems sufficient, so no changes proposed. Beam parameters based on HT's simulation of the target was advised to be checked with the target group, as they are very different from the ones used at pre-CDR.  One of the problems of HT's distributions is that they give a very low emittance beam which, if true, would allow various relaxations in the Stage 1 beamline to be considered while giving some issues for the preparation of the beam for injection into the FFA.

**Action 22-11-15-01: Jaroslaw Pasternak** organise meeting with Elisabetta Boella to discuss simulation parameters from the target and the capture section lattice.

A new student will be employed to study the capture parameters, but not for several months resulting in the new information not being available until after the 31 January milestone *M1 - LhARA lattice optimisation, aperture estimation, parameter list and schematic diagram update.*

NB asked when more engineering input is necessary. All agreed that the effort should not be lost, but some input will be definitely needed on some parts like the target chamber/GL1 interface or Energy Collimators area.

The information is available to generate an Excel file for the stage 1 lattice to enable a CAD update but it was agreed to hold on the CAD update until after the meeting with Elisabetta to take advice on the capture parameters.

Ajit raised a question concerning if there is evidence that the cavities are needed. Ken confirmed that a limited study was done by a student, but more detailed work would be required to establish the necessity for phase rotation after capture (stage 1) and control of bunch length at the end station (stage 2). Space allocated for cavities in the lattice is 0.5m. Parameters for the cavities could be defined to establish what reference designs could be available.

Ken requested that the simulation and CAD coordinate system recorded in the Notes and Actions of meeting held on 2022-11-01 should be recorded in a LhARA technical note to ensure that it can be found easily in the future.

**Action 22-11-15-02: Neil Bliss** to write the technical note.