RICH 1 Detector – LS2 Upgrade

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On behalf of the RICH team

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Status of Documentation

- All procedures for dismantling and installation to be laid out in WPP document
  - Covers logistics, personnel, training requirement, toolkits & safety
  - Provides detailed information on how to approach each step including safety precautions and preliminary work for each
- Next progress review aiming for mid-July
  - Review of status of document and the concepts for the various installation toolkits with outstanding design work required
  - Constantly evolving document, no final review date
- Master CAD model updated as new contributions become available
- Work package safety plan (1st draft) to be completed by end of June, updated along with WPP

Specific Personnel

Role	Person	Training Required	Status
WPL	Michael Booth	Radiation Controlled Zones (1 Day) UX85B Access (3 Online Modules)	Required Refresher
WPL	Peter Loveridge/TBD	Radiation Controlled Zones (1 Day) UX85B Access (3 Online Modules)	Required Required
Technician	TBD	Radiation Controlled Zones (1 Day) UX85B Access (3 Online Modules) Electrical Habilitation - Uncertain	Required Required ? ? ? ?
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Support from technical staff	TBD	Assumed completed relevant training	

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Required contributors

- Radiation Workshop
  - Modification of the shielding (in-situ) and shelves (transported to workshop)
  - Requires advance booking of effort
- Transport
  - Transport of shelves for modification. Movement of existing toolkits from storage to assembly zone. Movement of toolkits/subsystems from assembly zone to pt. 8
- Crane operators
  - Movement of toolkits/subsystems into LHCb Cavern
  - Movement of sub-assemblies onto rail system (to be discussed)

Required contributors

- Vacuum Group
  - Role discussed in the next few slides
- Survey team
  - Need to be booked in advance. Steps where this is required TBD, definitely required for surveying of flat/spherical mirrors.
- Appropriate staff from collaborators
    - MaPMTs
    - Gas Enclosure
    - Flat/Spherical Mirrors
    - Etc.

WPP Key Steps - Dismantling

Step 1: Remove Shielding doors

Step 2: Disconnect cables to the upper shielding

Step 3: Disconnect cables to the lower shielding

Step 4: Remove Gas enclosure doors

Step 5: Remove flat mirrors

Step 6: Remove Spherical mirrors

Step 7: Remove exit window, dismantling & removal of beam pipe

Step 8: Remove Photon detectors (HPDs)

Step 9: Remove seal to VELO

Step 10a: Install rails on shielding

Step 10b: Remove Gas Enclosure

Step 11: Remove Shielding shelves

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WPP Key Steps - Dismantling

Step 7: Remove exit window, dismantling & removal of beam pipe

- Affected subsystems: TT, Beampipe
- TT removed or open. Exit window to be attached to frame then moved away from RICH 1 (towards magnet). Beampipe supports required on –Z side of window before removing supports on +Z.

Step 9: Remove seal to VELO

Step 10a: Install rails on shielding

- Affected subsystems: VELO, Beampipe
- Beampipe service platform to remain in gas enclosure. Inspection of seal to VELO should be carried out by parties from RICH1 and VELO.

WPP Key Steps - Installation

Step 12: Modify shelves

Step 13: Install upper MaPMT chassis

Step 14: Installation of shielding shelves

Step 15: Installation of Gas enclosure

Step 16: Install Seal to VELO

Step 17: Installation of the Beampipe & Exit Window Preparation

Step 18: Install flat mirrors

Step 19: Install Spherical mirrors

Step 20: Installation of Exit window panel

Step 21: Bake-out of beampipe (TBD)

Step 22: Diaphragm seal to beampipe

Step 23: Install Gas enclosure doors

Step 24a: Install Lower MaPMT Chassis

Step 24b: Remove rails on shielding

Step 25: Install MaPMT Columns

Step 26: Installation of shielding doors

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WPP Key Steps - Installation

Step 16: Install Seal to VELO

- Affected subsytems: VELO, Beampipe
- Again, require beampipe service platform inside gas enclosure

Step 17: Installation of the Beampipe & Exit Window Preparation

- Affected subsystems: TT, Beampipe
- To be completed before installation of UT. Beampipe in place with temporary supports next to gas enclosure. Mount exit window to frame and move toward gas enclosure. Attach beampipe supports in magnet region, remove temporary supports, install exit window.

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WPP Key Steps - Installation

Step 21: Bake-out of beampipe (TBD)

Step 22: Diaphragm seal to beampipe

- Affected subsystems: Beampipe
- Bake-out beampipe before installing gas enclosure doors (Both A and C sides). Allows access for heating blankets and spherical mirrors move away from beam.
- Exit window diaphragm seal not required to be attached to beampipe at this stage. It can be insulated from the beampipe during bakeout and installed after.

General Considerations for Beampipe

- In addition to previously mentioned steps...
- Specific sequencing takes place in some steps to prevent unnecessary work above beampipe. Wherever risk for impact is identified the beampipe will be protected or the risk managed by sequencing.
  - E.g. translation systems for upper mirrors installed before beampipe is re-installed.
- Staff from vacuum group required to be present at relevant stages.
  - WPL to contact vacuum group to arrange this.
  - Worthwhile for members of vacuum group to be present at next RICH1 WPP progress review. We will be in contact with details.

Handling & Tools

- Existing toolkits
  - Stored in various locations, mainly Previssin. To be retrieved and assembled/examined in advance of any dismantling work to check suitability.
  - We have toolkits for dismantling of:
    - HPDs
    - Flat & Spherical Mirrors
    - Removal of beampipe (beampipe platform)
    - Exit Window
    - Quartz window
- Outstanding steps: Locate calculation statements and instruction manuals. Refurbish if required to check suitability.

Handling & Tools

- Modifiable toolkits (installation)
  - Exit window, scaffold, quartz protection

- New toolkits
  - Rail system to suit:
    - Removal and installation of shielding shelves
    - Removal and installation of gas enclosure
    - Installation of upper and lower MaPMT Chassis
  - Flat/Spherical mirror installation frame & boxes
  - Lifting equipment to be qualified by CERN

RICH1 Subassemblies to be Removed from UX85B

Part name	Description	Short term destination	Final destination
Gas enclosure & Mirror supports	Large aluminium box	Surface Storage	Disposal
HPDs	Electronics in housing	Surface Storage	---
Flat mirrors	Glass mirrors	Surface Storage (in boxes)	---
Spherical mirrors	Carbon fibre mirrors	Surface Storage (in boxes)	---
Quartz window	Quartz and Aluminium frame	Surface Storage (in box)	---
Exit Window	Carbon fibre & Rohacell Composite Window	Disposal. Salvage diaphragm seal for mechanical testing.	Diaphragm to RAL
MDCS System		Surface Storage	Salvage positioning systems. Dispose of not-useful parts.
Photon Funnel		Surface Storage	
Seal to VELO	Aluminium Bellows	Re-use. Surface Storage	RICH1 LS2 Upgrade
Shielding Shelves	Iron shelves to be modified	RP Workshop (3-4 days)	RICH1 LS2 Upgrade

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End of main presentation

- Further material:
  - Example of WPP steps
  - Examples of existing tooling

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Example of WPP Step

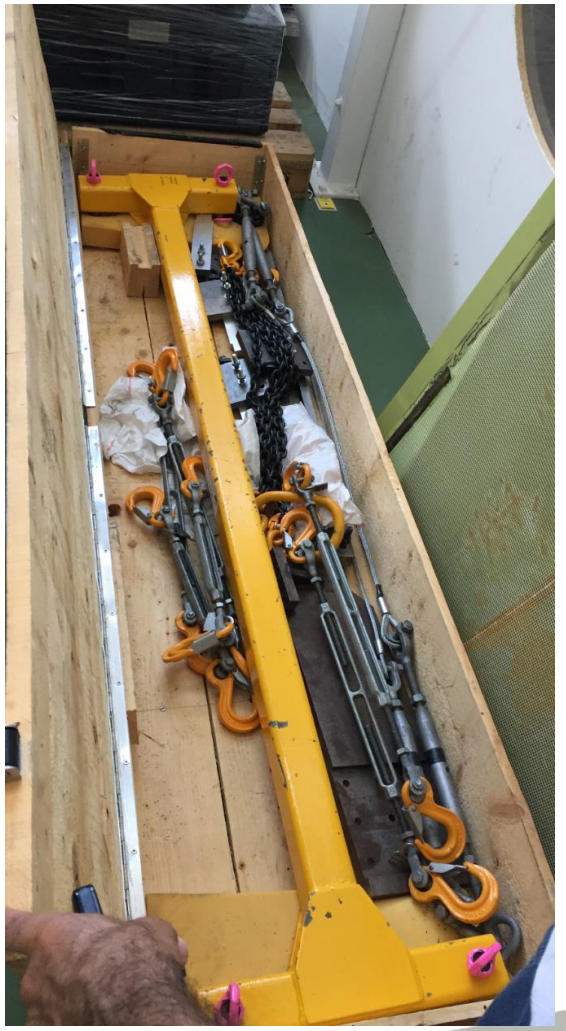
Figure 13 - Old RICH1 Exit Window Installation Toolkit

STEP 7 – Removal of exit window			
Summary: The exit window installation equipment is currently in storage at CERN. This will need to be fully set up as a preparatory action to prevent damage to the beam-pipe.			
Preparatory work: Make sure the TT/UT is open or uninstalled as access will be required to allow for mounting of the installation tooling. Installation tooling must be checked for damage and suitability.	**Details:** *Visual inspection of area.* *Visual inspection of old toolkit.* *Test assembly of old toolkit to ensure all parts present.*	Number of persons: *1*	Time Estimate: *1 day*
Work: Assemble installation tooling. Cut seal. Remove window using installation rails, can be manhandled when suitably clear of beamline. *2 person lift.* The exit window will need to be transferred over existing beampipe supports during removal. The beampipe/vacuum group should be present for this and provide adequate supports for the beampipe during this delicate operation.	**Details:** The installation tooling must be assembled onto the downstream (+Z) face of the RICH1. The diaphragm seal will then be cut off. The frame will then be used to delicately slide the window off the beampipe. When a set of beampipe supports is reached, a replacement should be put in place in the –Z direction of the exit window before removal of the downstream components. Once a suitable clearance from the beampipe has been obtained, the window can be manhandled and carried away from the experimental area ready for disposal. *Allen keys, side cutters, Old RICH1 Exit Window Installation Toolkit*	Number of persons: *3* *1 of which shall be from vacuum group.*	Time Estimate: *1 days*

HPD Lifting & Rotation Frame

Bottom HPD Supporting and Transport Frame

Lifting beam for upper HPDs



Mirror Storage Boxes

(Spherical)

(Flat)

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