

## Instructions for Alignment at Beamline

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#### **Step:**

- 1.) Zero all knobs on the telescope (don't forget the left/right mirror at the front lens).
- 2.) Find reference points on the floor or walls to position the telescope (**BL11:** use half the distance between the left/right beamline platform anchor holes and the center of the front anchor hole. **BL10:** use stickers on the ground)
- 3.) Find the right height and angle of the telescope (**BL11:** photon beam goes down by 3deg. Mount holder for angle measurement tool on telescope and level the telescope – install angle tool, zero it, and pivot telescope by 3deg. Use special 2.75in beamline bellow-cuff with bull's eye and swing the beamline arm (on floor) left and right till it is in line with the telescope. Adjust the height of the telescope according to the height of the bull's eye. **BL10:** photon beam is horizontal. Level the telescope and find the right height looking at a cross on the center of the exit flange. Use a plumb bob pointing to the thin differential tube of the beamline. Pivot the telescope and find the string of the plumb bob – adjust left/right of the telescope accordingly; return to horizontal position afterwards).
- 4.) Fix the position of the telescope (knobs on telescope and stand) – barricade the telescope area – move in the chamber and move it roughly in the photon path (**BL11:** Use 3 blue car jacks, 4 transfer plates. **BL10:** use 4 transfer plates only).
- 5.) Use differential tube in the chamber as a reference. Use socket pipe alignment tools with wire cross and/or pin hole for one side. Close in the 2.75in gate valve partly to focus on the other end of the tube.
- 6.) Get the transfer plates out carefully (use the 4 red scissor jacks to avoid too much movement) – readjust with the special COLTRIMS fine adjustment tool – fine tune by moving the chamber on the frame – fix the chamber in place (install earthquake bracket and tighten all bolts).
- 7.) Install the spectrometer, detectors, and both phosphors – connect all cables. Adjust height of spectrometer while looking with the telescope on the punch marks of the copper plates
- 8.) Use Spectrometer-Jet-Dropdown-Tool to position spectrometer centered on the gas jet skimmer hole. Check by eye – then check with telescope. Fine-tune height and center position.
- 9.) Replace Spectrometer-Jet-Dropdown-Tool with Spectrometer-Rotation-Dropdown-Tool (dial in height of the photonbeam in the spectrometer first on the tool) and use the telescope to align the tunnel in the tool with the differential tube in the chamber. Fine-tune the height and then the rotation of the spectrometer.