

(Draft) OSP for PREX and CREX Targets

Robert Michaels

Thomas Jefferson National Accelerator Facility

May 31, 2016

This is a very rough version of the OSP for the PREX and CREX targets.

I INTRODUCTION

The PREX and C-REX experiments are expected to run back-to-back. The target configuration is sketched in figure 1. The PREX target consists of a 0.50 mm thick (568 mg/cm²) isotopically pure lead ²⁰⁸Pb foil sandwiched between two 0.25 mm diamond foils. The diamond helps conduct heat from the lead to prevent melting. The C-REX target consists of a 7 mm (1 gm/cm²) thick isotopically pure calcium ⁴⁸Ca slab that is tilted at 45° to the beam to increase its effective thickness. In addition, each target location has a set of auxiliary targets on an insertable frame. Among these are a water cell target, carbon targets of various thicknesses, and the “holey” carbon target.

II RADIATION HAZARDS

The lead target is a ~ 10% radiation length and the calcium target is a ~ 6% radiator. They therefore produce a significant radiation load in the hall. (More discussion of the radiation hazards and their mitigation here ...)

III HAZARD OF OVER-HEATING

The main risks to the lead target is that it can melt. The other targets have similar risks but should not melt if operated within the stated operational

limits. The only source of heat is the beam. The raster should always kept on with at minimum size of 3 x 3 mm². Trained target operators (TO) are required during PREX and C-REX. The TO should observe the GUI (figs 2,3) and watch if the target return line warms up more than 30K. There should be alarm for this. If it does, turn off the beam and call a target expert. The target operators should periodically run the program “spot” to observe the target density distribution. (More on this in a later draft). If a hole has developed, call an expert.

IV TARGET OPERATOR RESPONSIBILITY

Here we describe the responsibilities of the TO, how to use the control GUI (fig 2), common problems, etc. The following is still a pretty rough draft.

- Checking target temperature
 - Click on Cryostat bottom, right. Look at Loop 2 temperatures. In fig 3, as an example, it’s 19.5 K input and 21.6 K return line.
 - Most important to look at Return Line Temp on Loop 2 (here it’s 21.6 K). These temps should be below 30 K at all times. An alarm should sound.
 - If you are confused about anything, turn off the beam, call the expert. The only source of heat is the beam.
 - The target operator needs to know how to adjust the JT valve. That’s the only coolant control knob we have. It probably will not have to be adjusted ever, unless an expert asks for it.
- Rebooting Target IOC
 - Go to <http://hareboot7>
 - Select chan 5 and 6 (iocha13)
 - Select Control Action ”Reboot Immediately”.
 - click Next and then Apply
- Restarting Target Alarm Handler
 - On the Hall A Cryotarget GUI click on ”Alarms”
 - If an error message appears click ”OK”
 - Double click on ”/home/poltar/Screens/ALH”.
 - Double-click on ”atargPREX.alhConfig”.

- Alarm and Major Events

Pay attention to alarms. Make sure you know what caused the alarms and take care of them. If you are not sure, turn off beam, call the target expert.

PREX and C-REX Target Region

R. Michaels
April 2015

10 cm
||

PREX at 5 degrees, C-REX at 4 degrees

Top View

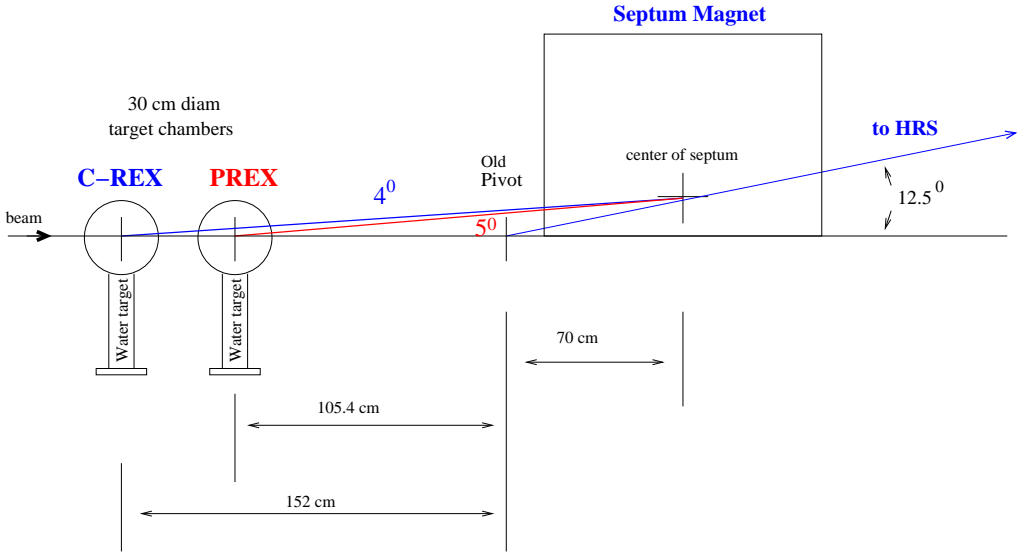


FIGURE 1. Top view of the target region for PREX-II and C-REX



FIGURE 2. Control GUI for the Lead target. The C-REX target is similar. And of course, this is just a rough draft copied from PREX-I.

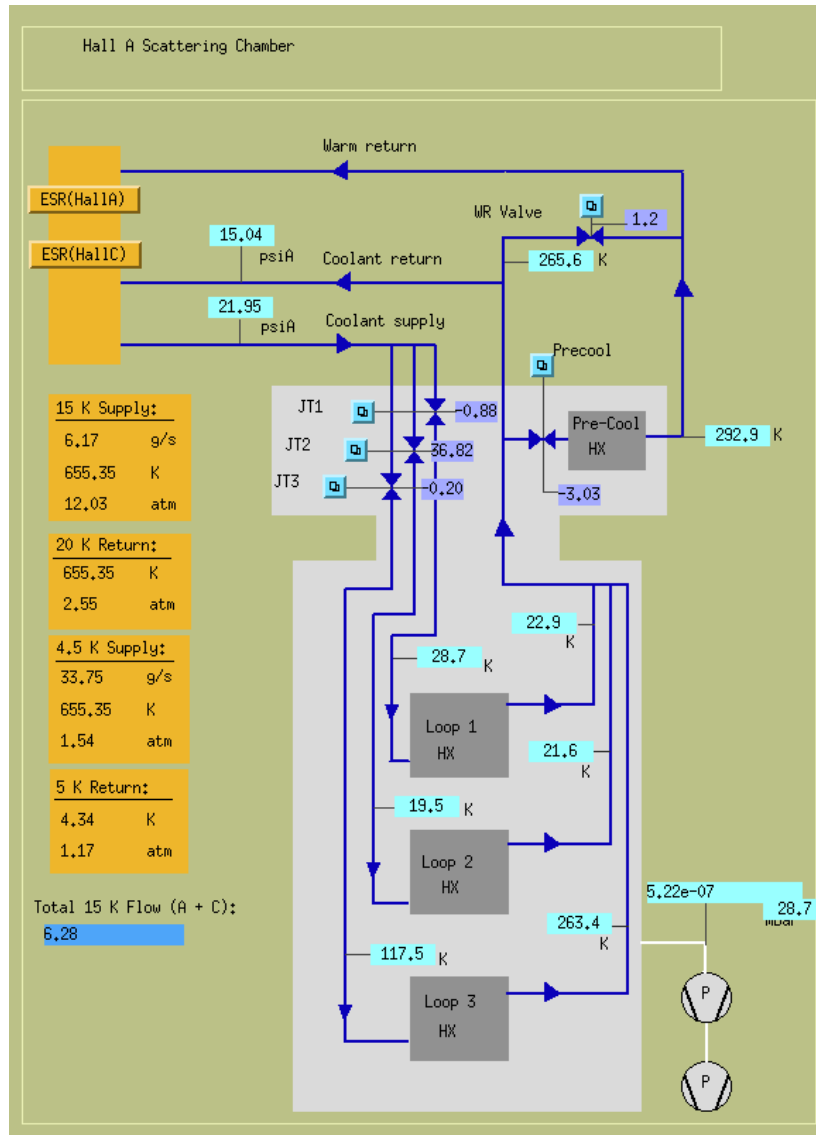


FIGURE 3. Cryogenic system used by the PREX and C-REX target system. And of course, this is just a rough draft copied from PREX-I.