Temporary Operational Safety Procedure (TOSP)

Cover Sheet

Division serial number PHY-01-005
(Assigned by Division EH&S Officer after approvals)

Issue Date: 3/30/01	
Expiration Date: (No later than 3 months after issue date.) 6/30/01	
Title: Gø Target Helium Circuit Pressure Test	
Location: Gø Target cage in Test Lab	
Risk classification (See ***EH&S Manual*** Chapter **3210**.)	Without mitigation measures:
	With specified measures implemented:
Author(s): Greg Smith	

Supplemental technical validations:	
Hazard reviewed: CRYO-MECHANICAL	Reviewer signature:
David H Kashy	David H Kashy

Signatures	
EH&S staff reviewer:	Bert Manzlak 3/30/01
Division EH&S officer approval:	D Skopik 3/30/01
Department or group approval:	R Carlini 3/29/01
Other approval(s): AREA SAFETY WARDEN	Tom Carstens 30 MAR 01
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Copies to: affected area, authors, division EH&S officer, EH&S Reporting Manager
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Pressure Test Procedure for the G0 Target Helium Refrigeration Circuit

March 30, 2001

The purpose of this test is to check the pressure integrity of the circuit to be used for the 15K, 20 atm., 17 g/s helium gas refrigerant for the G0 target heat exchanger. The test will be performed inside the G0 target cage in the test lab (see attached sketch of the G0 target cage location in the test lab). The entrance to the cage will be roped off or blocked with flagging tape for the duration of the test, and only test personnel who have signed the tosp will be allowed inside the cage. These personnel will wear safety glasses and hearing protection during the test. A sign stating "Pressure Test in Progress" will be posted at the entrance to the cage.

Although the nominal 20 atm. helium refrigerant is actually only 14-15 atm. in Hall C (according to Paul Hood & Mike Seely), we will perform the test to 400 psi (27 atm) with room temperature nitrogen gas, which corresponds to a safety factor of 2 over what is encountered in the hall, and a safety factor of 1.4 over the nominal 20 atm. The circuit to be pressurized will be contained within the much larger evacuated volume of the service module & test stand. A sketch of the relevant connections is attached.

When the target is in service in the hall, the ESR main compressor reliefs are set at 300 psig, ie the maximum pressure which can be supplied by the ESR is 20 atm., limited by the setting on this relief. The cold box has a 330 psig relief, and the transfer lines are equipped with 350 psig reliefs. The bayonettes are also equipped with 350 psig reliefs, these will be plugged for this test by Paul Hood. Instead, a 450 psig relief will be installed in our helium supply line to the inlet bayonette for this test by Paul Hood.

A rough estimate of the volume to be pressurized is as follows:

- inlet & outlet bayonettes 32" long, 1.5" od, 1.43" id (102.8 in^3 for both)
- 10" long, 3/4" id connection line from the inlet bayonette to the JT valve (4.4 in^3)
- 73" long, 1/2" id supply line from the JT valve to the heat exchanger (14.3 in^3)
- 300" of finned copper heat exchanger tubing with an id of 1/4" (14.7 in^3)
- 64" long, 1/2" id return line from the heat exchanger to the return bayonette (12.6 in^3)

So the total pressurized volume, neglecting the 3/8" line from the supply bottle, is 149 in^3.

The volume of the evacuated service module (65" long, 2' ϕ) and test stand (8' long, 2' ϕ) is at least 73,000 in^3, where we have neglected the additional volume (>3000 in^3) of the four-way cross on top of the service module to compensate for the fact that the target components take up some of the volume inside the service module and test stand. Therefore if the helium circuit were to suddenly rupture during this test, blowing the entire 400 psi volume of the helium circuit into the evacuated volume of the service module & test stand, the pressure there would only rise to about 0.82 psia, still a vacuum.

Also note that the heat exchanger itself has already been successfully pressure tested twice to 500 psi.

The first phase of the test procedure will be to pressurize the system with nitrogen gas to 40 psig and snoop for leaks in the external fittings.

The purpose of the second phase of the test procedure is to verify that the system is capable of achieving the pressure safety factor of 1.4-2. First we'll bolt on all the blankoffs for the test stand and service module. The actual target cell will be removed for this test and the conflats left open to see if any gas leaks from the heat exchanger into the space eventually intended for LH2. The service module will be connected to the test stand and that volume will be evacuated with the leak detector pump. The test connections as shown in the attached sketch will be made. The cage will be cleared and hearing and eye protection will be put on by the authorized personnel who have signed the tosp. The leak detector will then be isolated (valved off) while the pressure is raised slowly, and the test gauge will be monitored. The pressure will be kept below 400 psi using the bleedoff valve. A 450 psi relief valve acts as a secondary backup. Once a pressure of 400 psi is achieved we will close the nitrogen supply valve and see if the pressure holds. We expect to maintain the 400 psi for about half an hour, and then vent slowly into the atmosphere.

In the third phase of the test we'll replace the nitrogen bottle with a helium bottle. The service module and test stand will again be evacuated (if necessary) using the leak detector pump. When good vacuum is achieved the leak detector will be isolated and the helium circuit will be pressurized with helium this time instead of nitrogen, to a pressure of 100 psi. If the vacuum in the service module remains good, the leak detector will be opened to that volume to check for the presence of any small leaks.

A log of the test will be made by Kenneth Gustafsson or his designee. This will include the results of the test, as well as noting any minor changes in the procedure.

Authorized persons: The following persons are authorized to perform the test. The same personnel will be the only personnel allowed in the cage during the test. Their signature below indicates they have read and understood this TOSP.

Greg Smith (JLab) Greg Smith

Walter Kellner (Jlab) Walter Kellner

Paul Hood (Jlab) Paul B Hood

Kenneth Gustafsson (CalTech) K K S

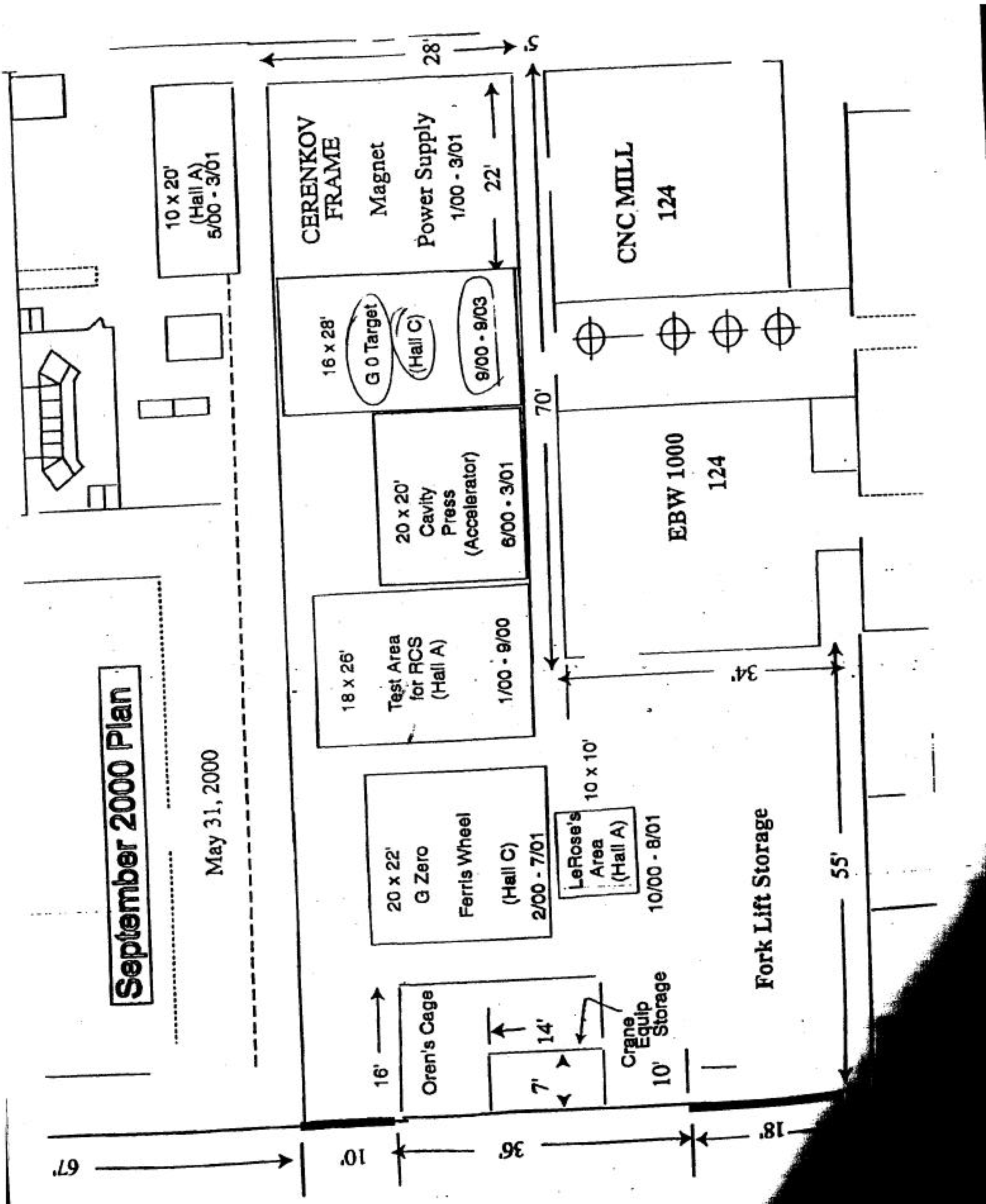
Silviu Covrig (CalTech) Silviu Covrig

No other personnel shall be added to this list without the authorization of Greg Smith.

(ER) Dan Bruck (JLab) Dan Bruck

Attachments

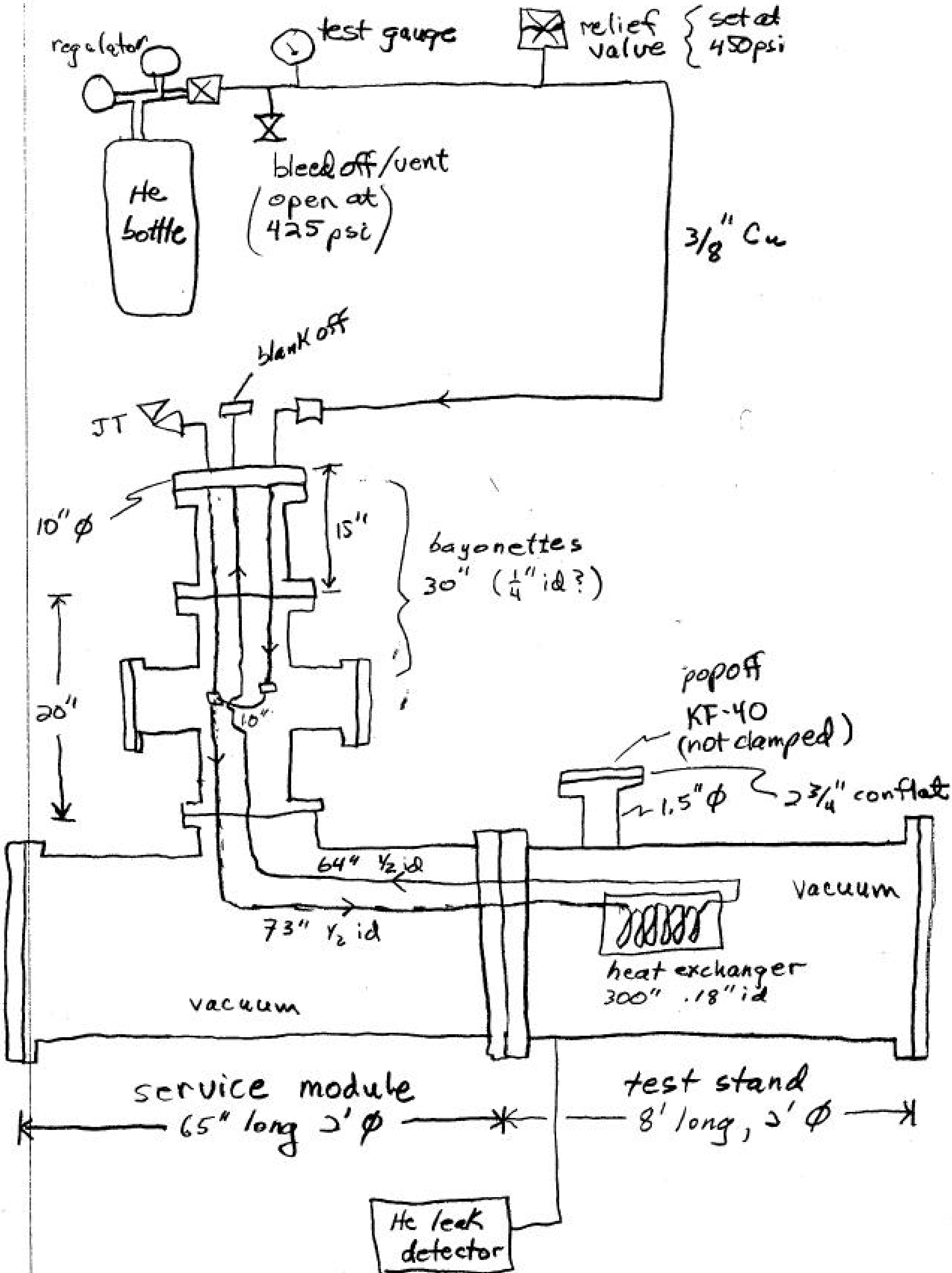
1. Sketch of the location of the G0 target test cage in the test lab.
2. Sketch of the connections relevant to this test.



GO target cage location in
TEST LAB, Bldg. 58

PHY-01-005

Gϕ Target Helium (refrigerant) circuit
Pressure Test Sketch 3/29/01 GRS



FR TDSP: PHY-01-005