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Informations to establish the RSAD for G^0 running in Fall '03 and Spring '04.

For the G^0 experiment second engineering run and forward production, we will use 8 different target arrangements located at three different positions in the hall. The entrance of the cryogenic target defines the origin of the position axis, the direction of the position axis is the one of the beam. For information figure 1 is a sketch of the target positions in the hall. The three target locations and arrangement are :

1. Nominal G^0 target (setups 1 to 7).
   The nominal G^0 targets are located inside the G^0 magnet. There are 5 different targets
   a) setup 1 : a cryogenic target is filled with liquid hydrogen. Figure 2 is a sketch of the cryogenic target. When passing through the target the beam sees three Aluminum windows for a total thickness of 0.46 mm, an Helium cell (pressure : 1.7 atm, density 4.19 10^{-3} g/cm^{-3}, length 16 cm) and 20 cm of liquid Hydrogen.
   b) setup 2 : a hole in an aluminum frame (diameter of the hole : 0.55 cm, thickness of the Al. frame 0.3 cm) at position 0 cm. This setup is used to measure beam halo and centering. In this configuration the cryogenic target is retracted out of beam.
   c) setup 3 : a hole in an Al. frame (diameter of the hole : 0.11 cm, thickness 0.3 cm) with copper washers (total thickness 0.39 cm) surrounding the hole at position 0 cm . This setup is used to measure beam halo. In this configuration the cryogenic target is retracted out of beam.
   d) setup 4 : this target is the target from setup 1 (filled with the usual LH2). Directly downstream of the regular cryogenic target (at location 21 cm) , a 0.75 mm thick Al plate (flyswatter) is inserted in the beam path.
   e) setup 5 : a 0.085 mm of Tungsten is inserted in the beam path at position -38 cm. At the location + 21 cm, a 0.75 mm thick Al plate is also inserted in the beam path. In this configuration the cryogenic

target is retracted out of the beam path.
f) setup 6 : the cryogenic target (described in setup 1) is filled with gaseous hydrogen at 37 K and 19.9 psig instead of LH2.

2. Moller target (setup 7).
   We will use the Moller polarimeter installed on the Hall C beam line to measure the polarization of the beam. The target is 4 μm iron at location -5562 cm.

3. Beam halo target (setup 8).
   In front of the G^0 magnet (roughly at position -500 cm), we will place a Al plate with two holes. The intent is to measure the size of the halo by sending the beam through one of the holes while taking data on any of the nominal G^0 target (setups 1 to 4). Those holes are drilled into a 2 mm thick Al plate, the inner radii of the holes are 6 mm and 11 mm.

PLEASE NOTE : Given that the three solid targets with hole (used in setup 2, 3 and 8) will measure only halo from the beam, their contributions to the overall radiation budget should be quite small and be neglected.

The G^0 experiment has been approved by the PAC for a second engineering run (23 days) and a forward angle production running (24 days). The 23 days of engineering run should include 10 days of data tacking. If this is not achieved, ten additional days will be added to the production running. Therefore for this radiation budget estimate, the total approved days is taken to be 57(=23+24+10) days. The number of scheduled days for G^0 running in Fall '03 and Spring '04 (as appearing on the Accelerator and Experimental Schedule published on June 04, 2003) is 109 days accounting for an efficiency of $\tilde{0}.5$.

Figure 3 is the radiation budget form for the G^0 running in Fall '03 and Spring '04.

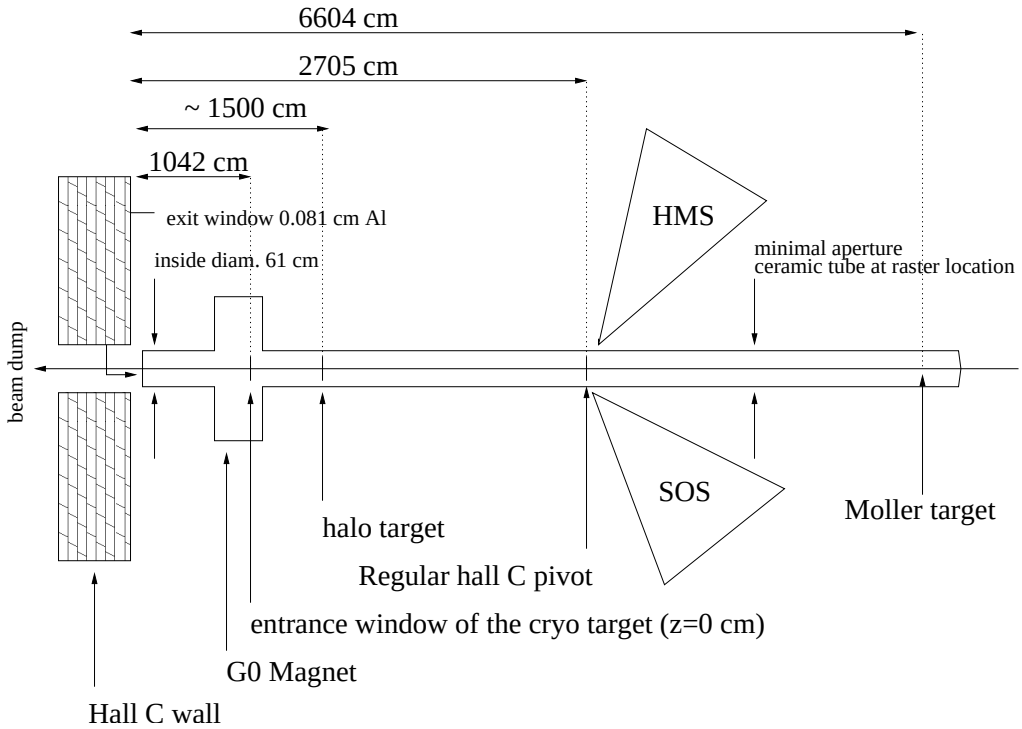

Figure 1: Sketch of the hall C arrangement during the G^0 running (not at scale).

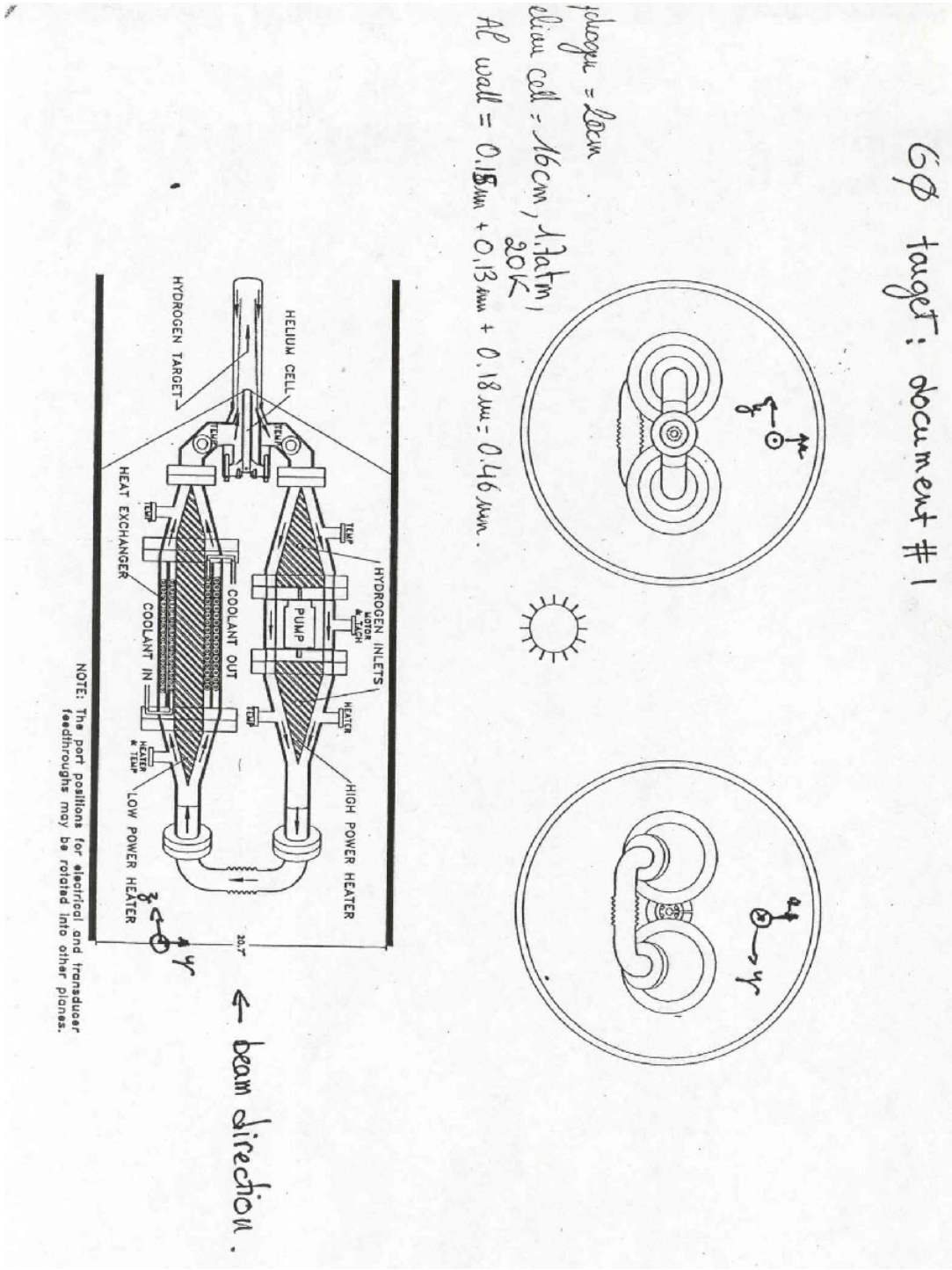

Figure 2: Sketch of the G^0 cryogenic target.

57 approved PAC days.

RADIATION BUDGET FORM

PAGE NUM/REV 1/-

Fill in blanks or (preferably) provide in tab-separated or Excel/WKS format.

Hall (circle one): A B (C)

experiment num.: 00-006(g^0) drawing num. supplied: _____ name of liaison: J. ROCHE

run hours (100% effect.)	days*	44	0.5	0.5	0.5	9.5	0.5	1.5											0.0
setup number		1	* 2	* 3	4	5	6	7	* 8	9	10	11	12	13	14	15	16	17	
beam energy	GeV	←			3.026		→												
beam current	uA(CW)	40	40	40	40	40	5	2	40										mean
polarization	%	←			70		→												
exp/target ID number																			
exp't target material (1)		H	Al	Al	H		H	Fe	Al										
exp't target thickness (1)	mg/cm2	1420	810	810	1420		35	3	540										
exp't target material (2)		He		Cu	He		He												
exp't target thickness (2)	mg/cm2	67		3480	67		67												
cryo tgt window material		Al			Al	Al	Al												
cryo tgt window thkns	mg/cm2	124			327	202	124												
radiator material						W													
radiator thickness	mg/cm2					164													
dist. radiator to pivot*	m					5													
exit window material*					Al														
exit window thickness*	mg/cm2				219														
critical dumpline radius*	cm	←			61		→												
crit. d'pline dist. to pivot*	m				104														
dumpline material*					Al														
dumpline length*	m				10.4														

*ONLY PROVIDED IF NONSTANDARD SETUP.

FYI							STP						OTHER MATERIALS IF USED			
material		D	C	H	Cu	Ti	He gas	Fe	Au	Be	O	Al	He gas	W		He gas
Xo	g/cm2	126.2	43.4	63.1	12.9	16.2	90.7	13.9	6.3	65.8	34.7	24.2		6.76		
density	g/cm3	0.162	2.3	0.071	8.93	4.50	1.78E-04	7.87	19.30	1.85		2.7	$4.2\,10^{-3}$	19.3		$1.7\,10^{-3}$

date form issued: authors:

in 'setup number' line, * designs hole target

(1.7 atm, 20K) (35K, 19.9 psia)

*Day = 24 hours of beam on target. Include fractional days, if appropriate.

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Figure 3: Radiation budget form for the G^0 running in Fall '03 and Spring '04.