C0 IR Director's Review

Cryogenics for a C0 IR

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Cryogenic Department

Cryogenic Dept. Responsibilities

Assess changes in cryogenic system loads

- Heat loads and temperature profile
- Liquefier loads

Non-Magnetic component design & build

- Cryogenic bypasses, Turnaround cans, Cryogenic spacers

Header modifications

- Interferences and extensions

Added instrumentation installation

- Power lead and thermometry

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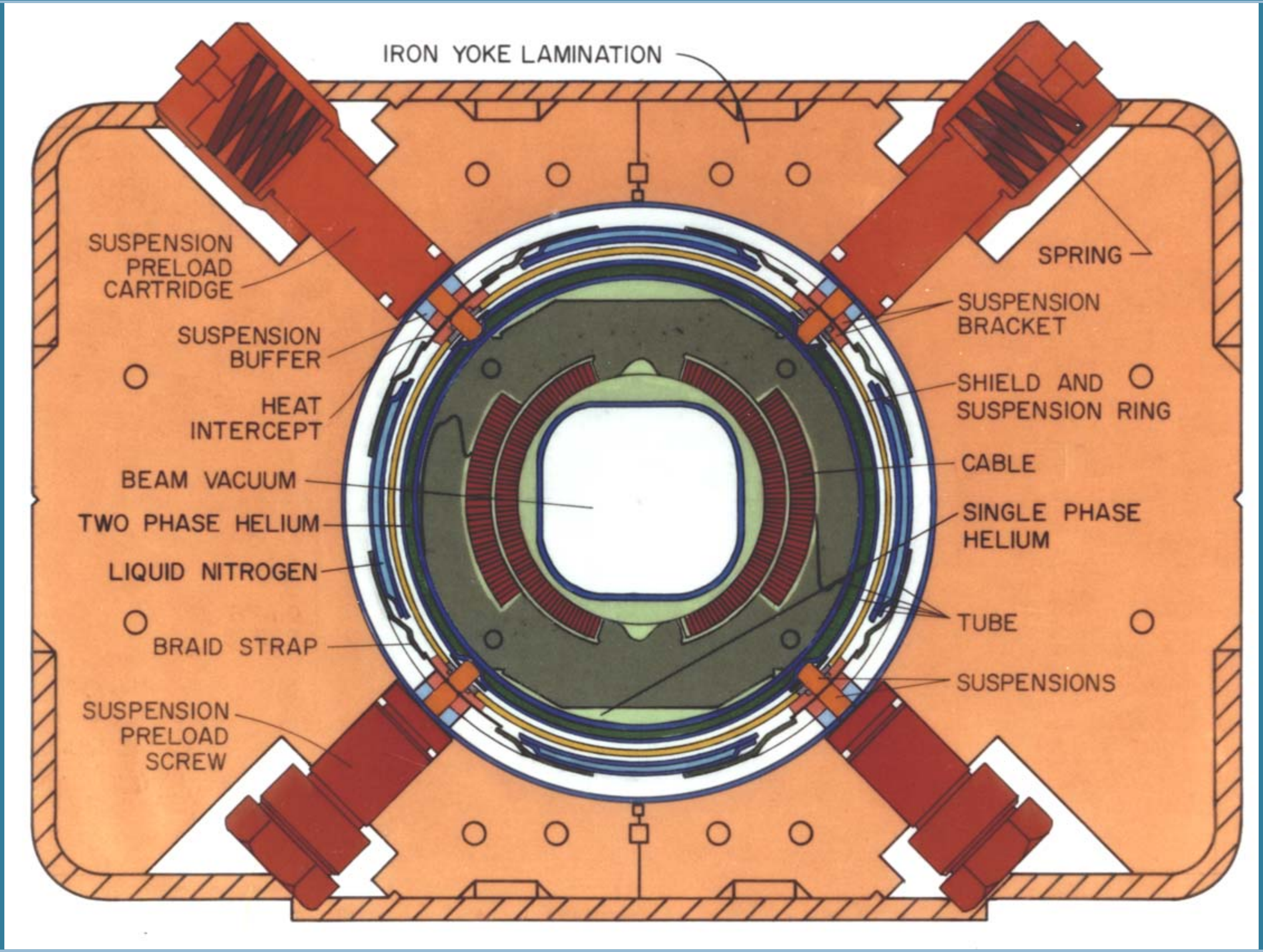
Tevatron Dipole Cross Section



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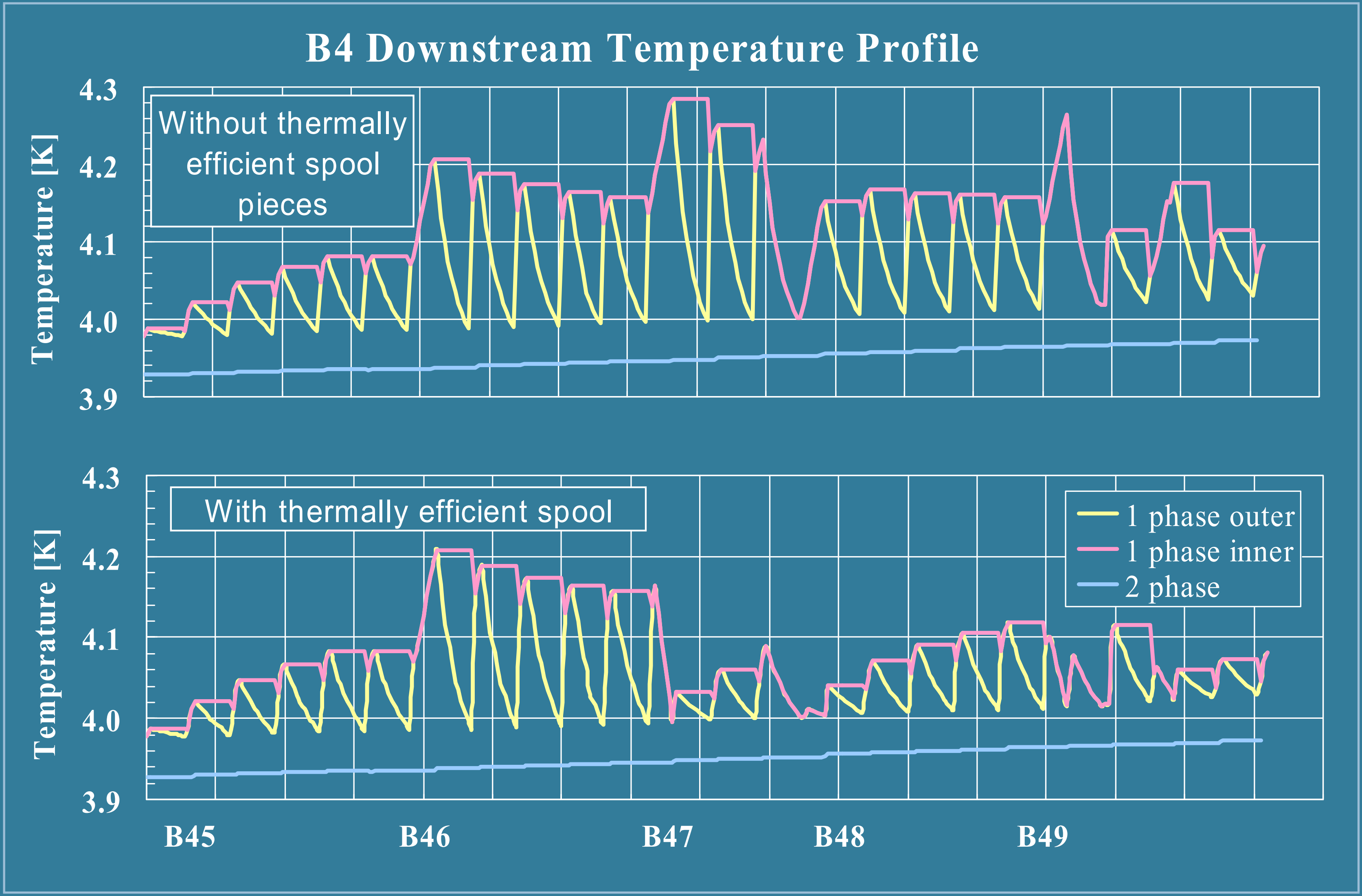
Tevatron Temperature Profile



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BTeV Power Lead Comparison

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	Collider Run II		BTeV			
	980 GeV Conventional		980 GeV Conventional		980 GeV HTS	
Power Leads	36.6 g/s	21%	48.4 g/s	28%	40.8 g/s	24%
Refrigeration (summer)	128 g/s	75%	130 g/s	76%	130 g/s	76%
Refrigeration (winter)	108 g/s	57%	109 g/s	57%	109 g/s	57%
Sub Total (summer)	165 g/s	96%	178 g/s	104%	170 g/s	99%
Sub Total (winter)	145 g/s	76%	158 g/s	82%	150 g/s	78%
CHL Capacity (summer)	171 g/s	100%	171 g/s	100%	171 g/s	100%
CHL Capacity (winter)	192 g/s	100%	192 g/s	100%	192 g/s	100%
Reserve (summer)	6 g/s	4%	-7 g/s	-4%	1 g/s	1%
Reserve (winter)	47 g/s	24%	34 g/s	18%	41 g/s	22%

Note 1

It is assumed that the components added for the C0 low beta system have sufficient margin and thermal efficiency to not require operating B4 and C1 at a temperature colder than during Run II.

Note 2

The capacity given is at maximum CHL operating pressure utilizing a three stage and four stage compressor as well as ring return flow.

Note 3

The summer/winter production capacity is based on the average July/January temperature, not the maximum/minimum temperature.

New Non-Magnetic Components

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Cryogenic Bypass

- 2+1 spare – separator bypasses (372.508” slot length)
- 1+1 spare – B48 bypass (199.091” slot length)

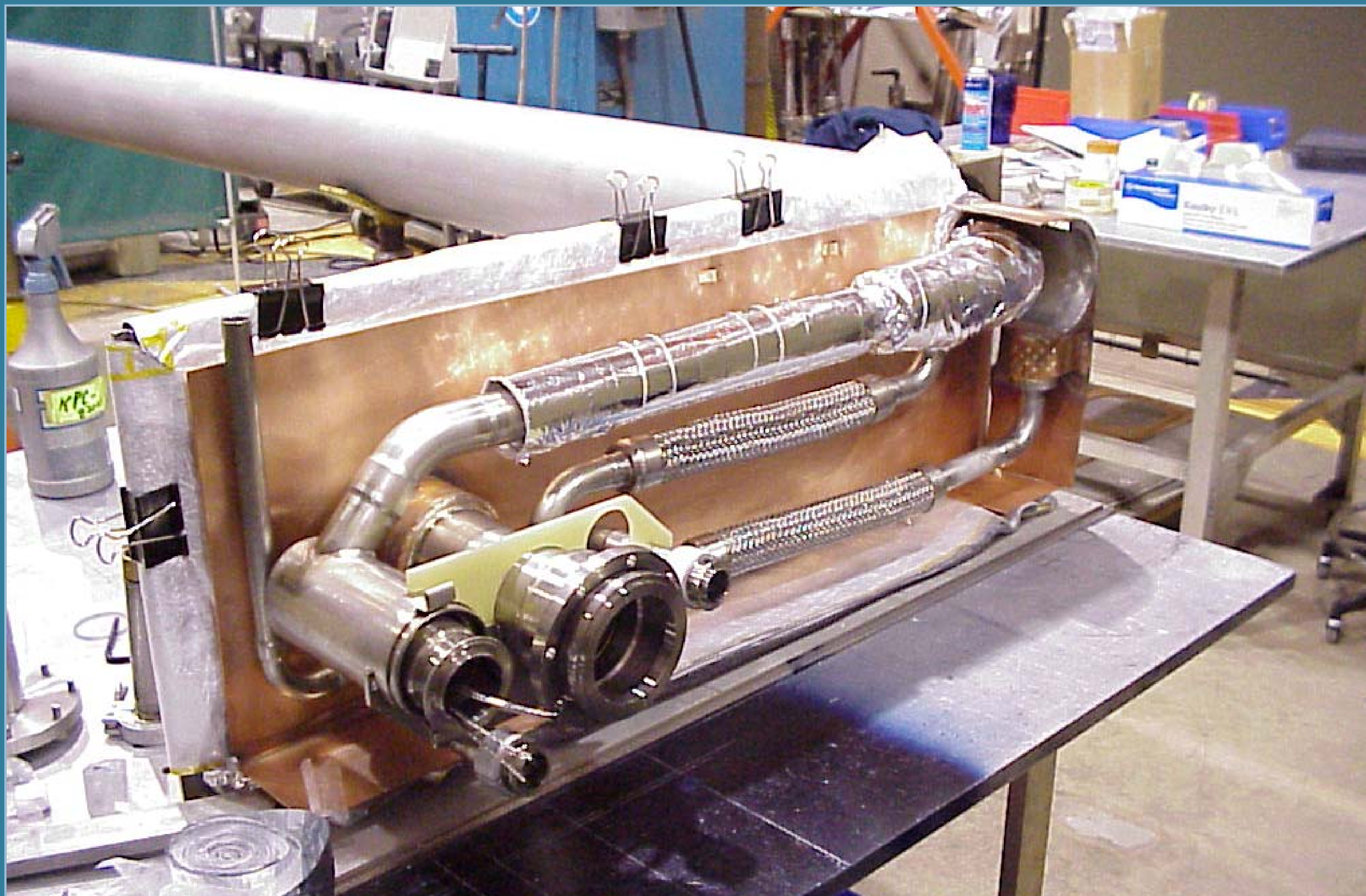
Cryogenic Spacer

- 1+1 spare (79.066” slot length)
- 1+1 spare (119.795” slot length)
- 2+1 spare (5.025” slot length)
- 1+1 spare (10.793” slot length)

Turnaround Can

- 1+1 spare with 5kA leads (29.000” slot length)
- 1+1 spare w/o leads (29.000” slot length)

Cryogenic Bypass



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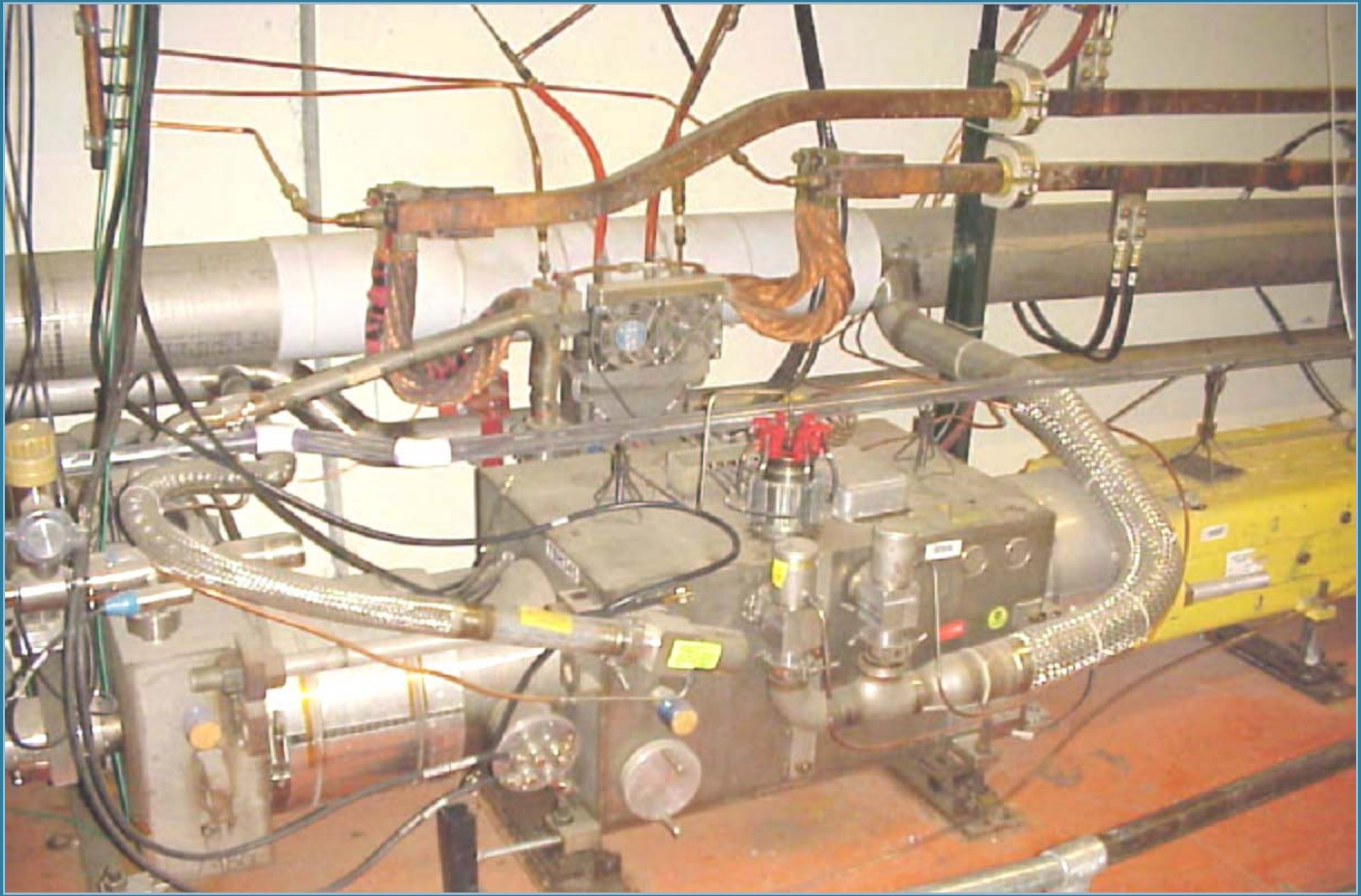
Header Modifications



New Instrumentation & Control

Thermometry

64	platinum resisters	power leads
21	Cernox™ resisters	single-phase He

Tubing for power lead flow

7,000’	½” tubing in 24 runs	
10,000’	⅜” tubing in 36 runs	
1,000’	¼” tubing in 2 runs	

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Conclusions

Refrigeration and liquefaction load budgets have been set within CHL capacity.

Thermally efficient component designs will maximize the operating quench margin.

Design of new non-magnetic cryogenic components has low technical risk.

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