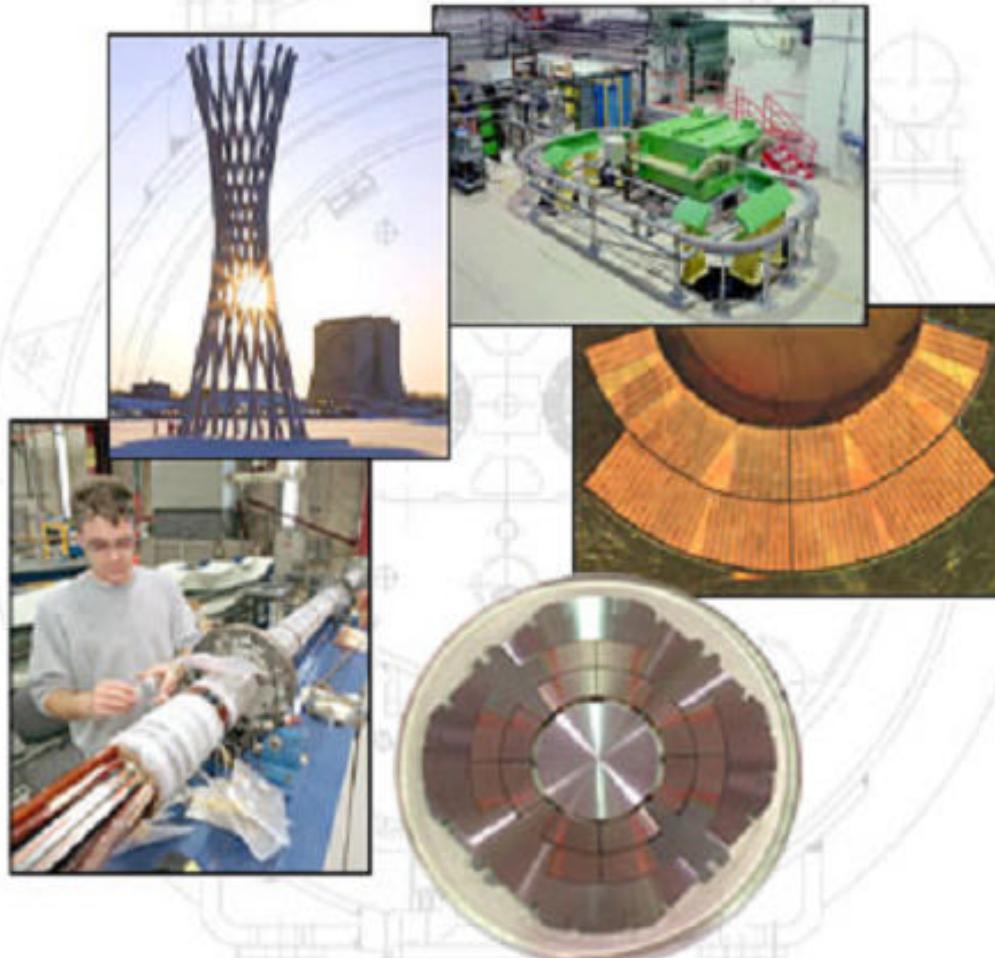




My first 8 months at the Technical Division





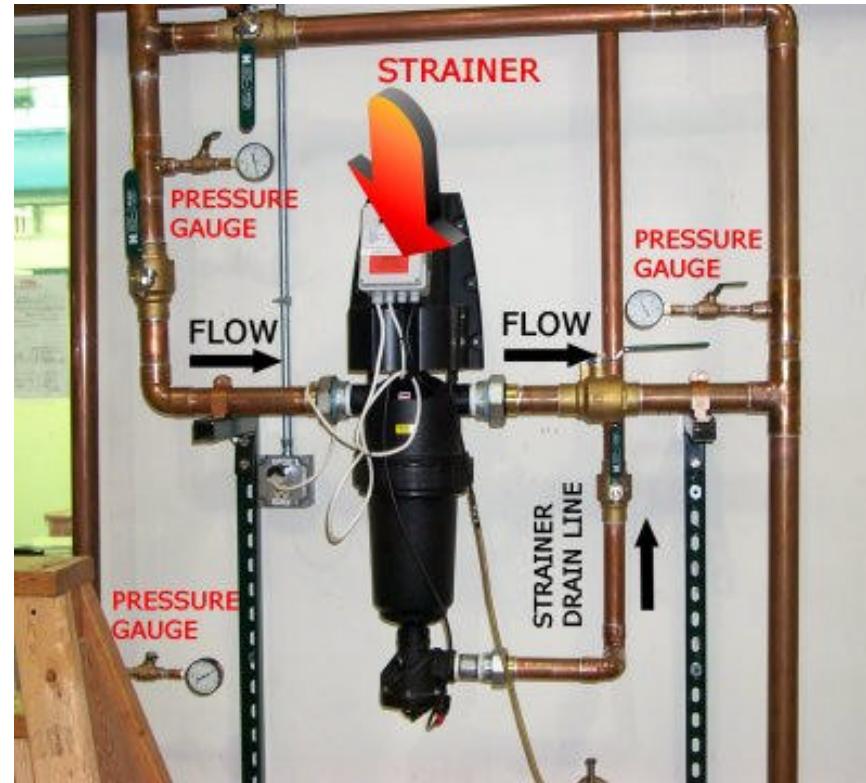
Nice to be back: Outline

- ICW for new vacuum furnaces in IB4
- Girders
- Tesla report
- Transformer to test splices
- BCP
- LC group web pages
- Displays in ICB



ICW in IB4

-1-

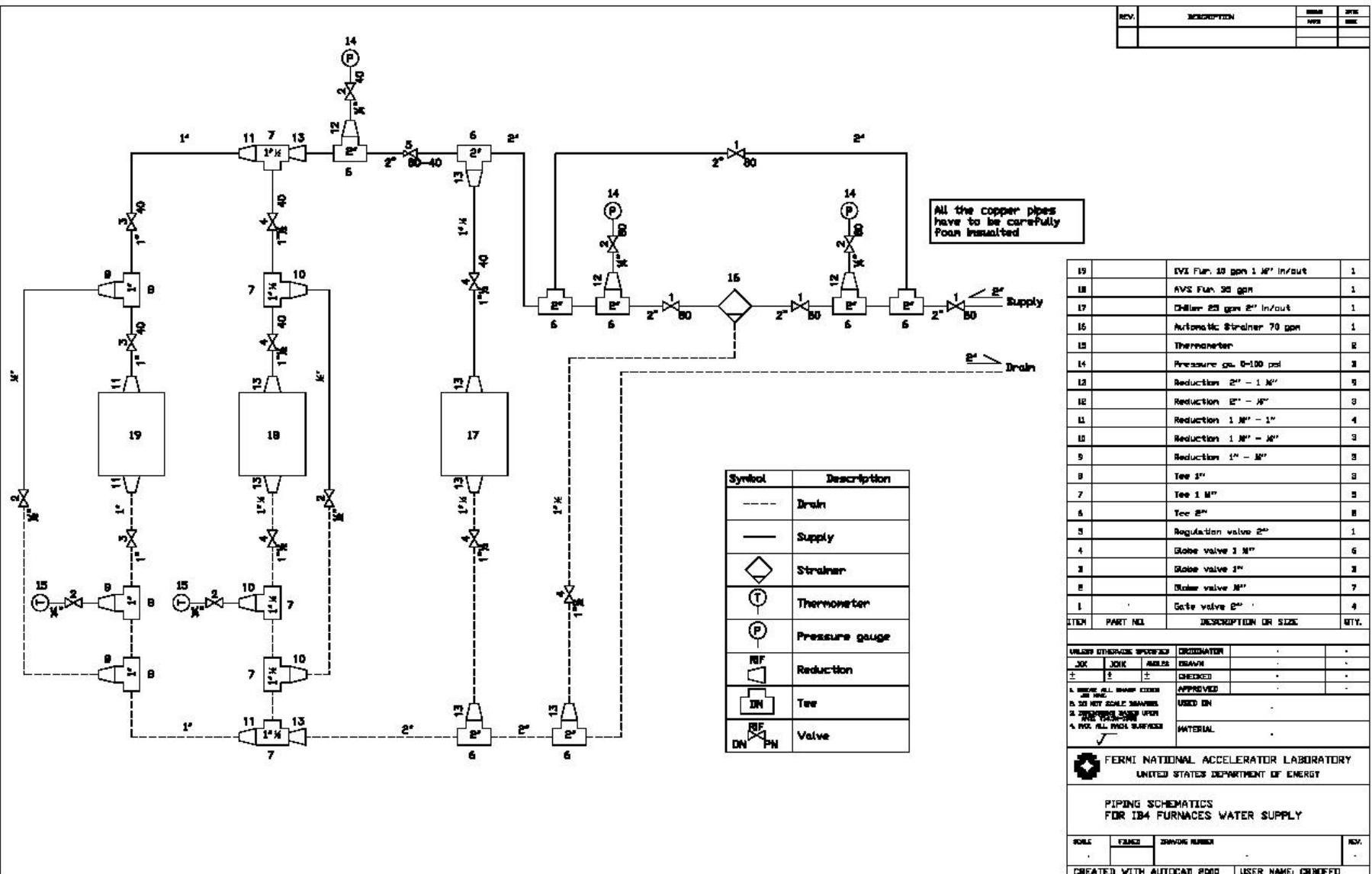


- 40 psi working pressure
- 35 gpm to big furnace
- 10 gpm to small furnace
- 25 gpm to chiller



ICW in IB4

-2-





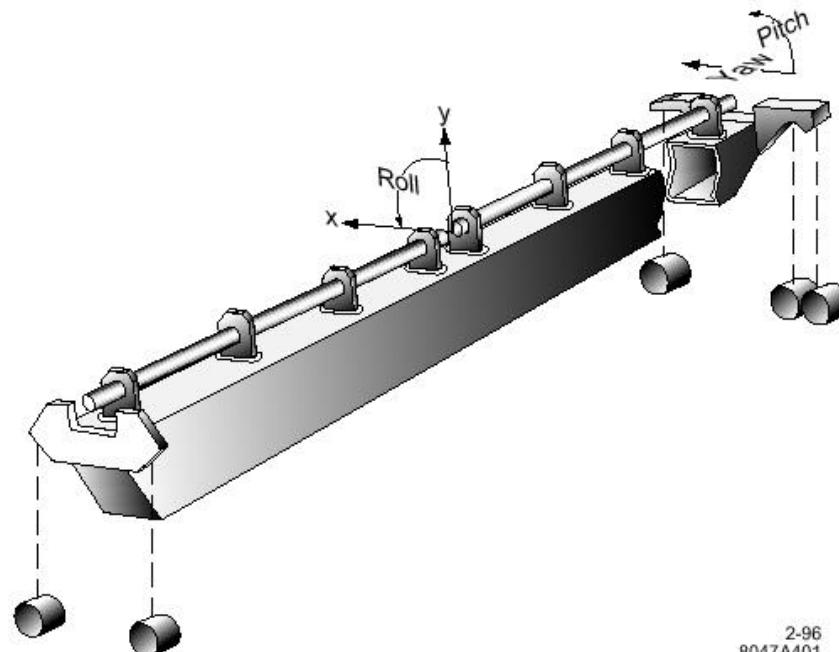
Outline

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What is a Girder?

Moving supports for accelerating structures to be used in NLC



2-96
8047A401



Why Girders?

1 Structure (5 points best fit curve) short wavelength:

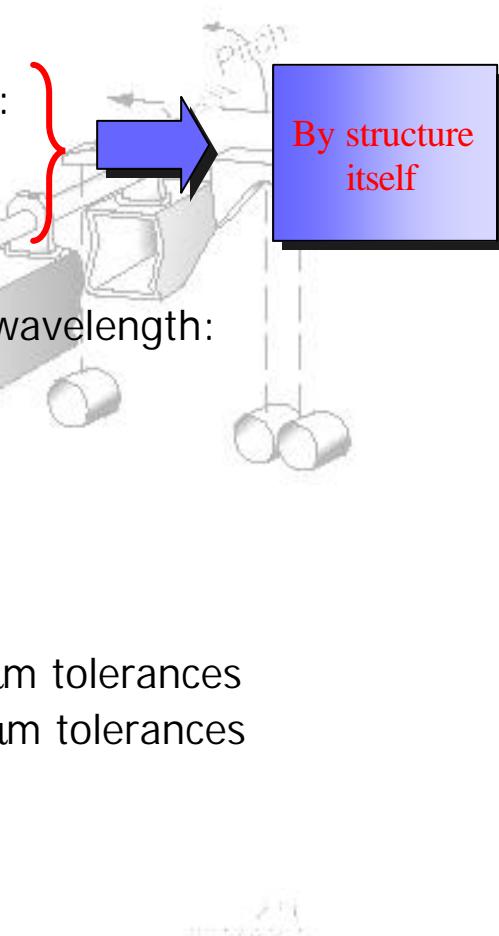
- +/- 200 μ m horizontal
- +/- 50 μ m vertical

6 structures on girder (30 points best fit curve) long wavelength:

- +/- 200 μ m horizontal
- +/- 100 μ m vertical

GOALS:

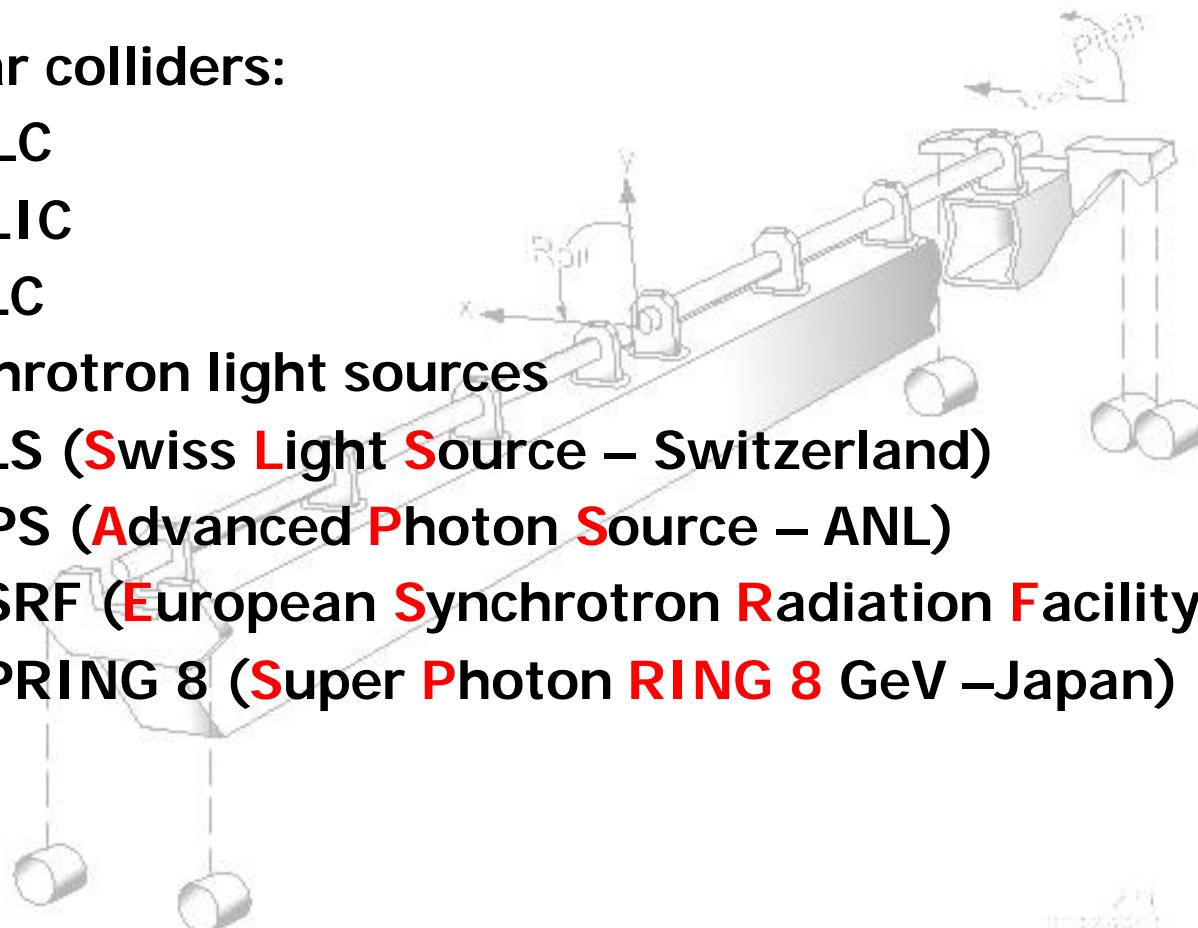
- Structure on spaceframe positioned with +/- 10 μ m tolerances
- Spaceframes on girders positioned with +/- 100 μ m tolerances
- Girder positioning to beam





Who designed Girders?

- Linear colliders:
 - NLC
 - CLIC
 - SLC
- Synchrotron light sources
 - SLS (**Swiss Light Source – Switzerland**)
 - APS (**Advanced Photon Source – ANL**)
 - ESRF (**European Synchrotron Radiation Facility – France**)
 - SPRING 8 (**Super Photon RING 8 GeV – Japan**)





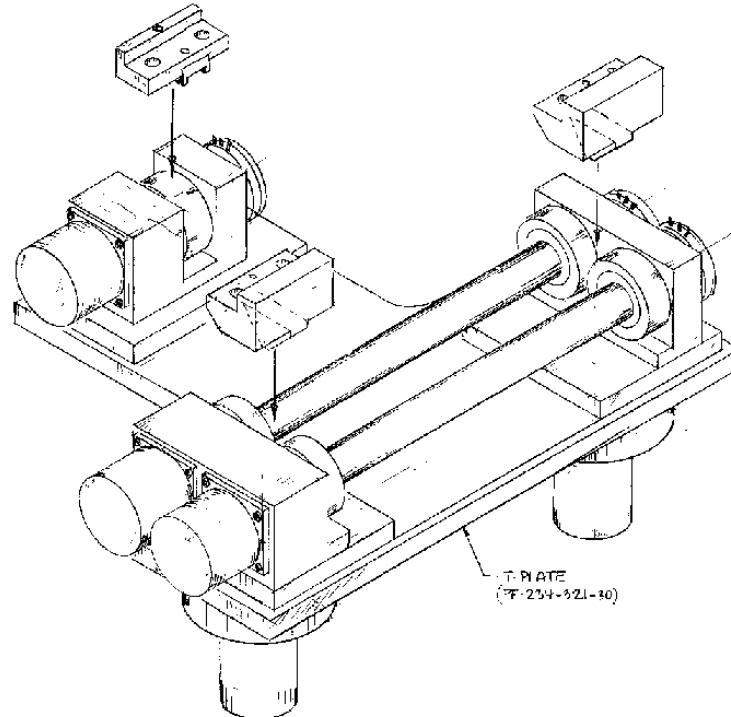
Comparison

	NLC FFTB	CLIC CTF2	SLS	APS	ESRF
DOF	3	3	5	3	3
GIRDERS			48		96
SYSTEM	3 Cams	3 Jacks	5 Cams	Jacks	Jacks
MOTION RANGE	+/- 1 mm	+/- 5 mm	+/- 2 mm		
POSITIONING ACCURACY	5mm	10 mm	3 mm	+/- 150 mm relative pos	10 mm rel. 100 mm Km
POSITION CONTROL	Pots LVDT BPM	HLS TILTmeter BPM	HLS HPS Dig encoder BPM		HLS Plates
ALIGNMENT ON GIRDER	LVDTs CMM		Laser interf. CMM		Laser interf.
ELEMENTS ON GIRDERS	magnets	magnets	magnets	magnets	magnets
MOTORS	Stepping Harm. drive	Stepping	Motor warm Planetary		



SLAC design

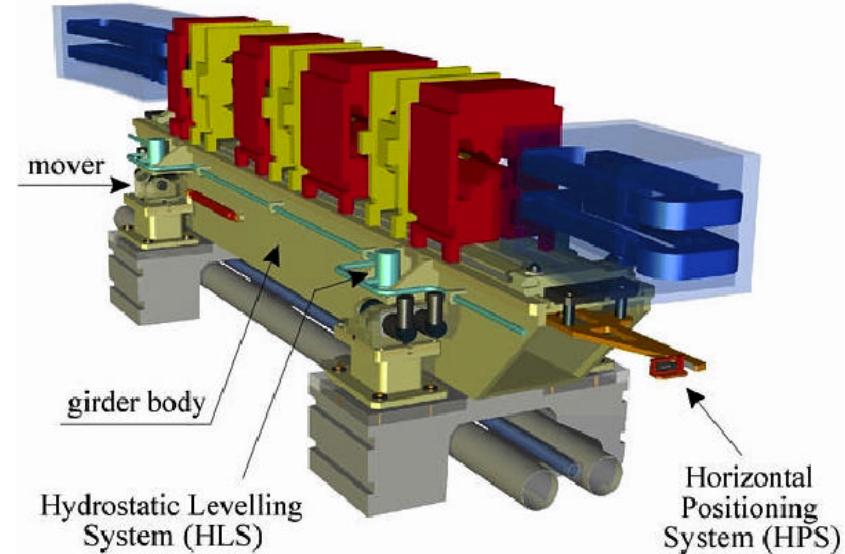
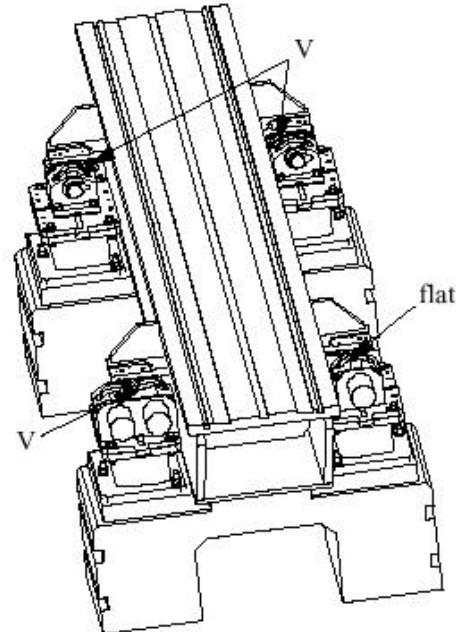
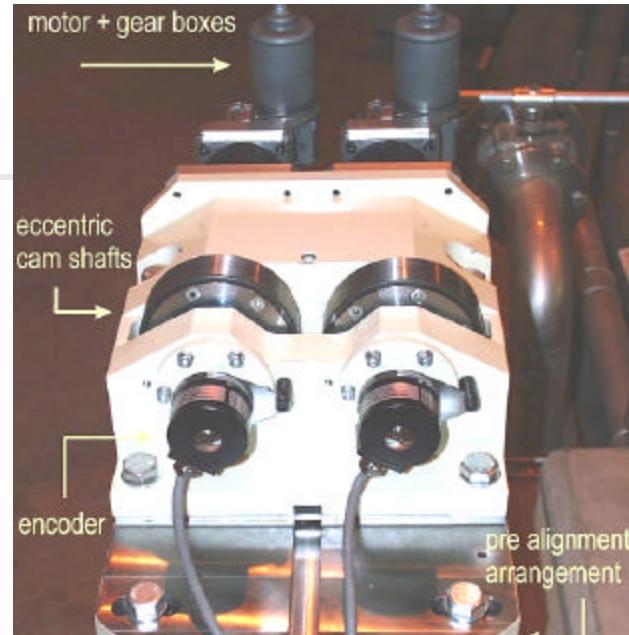
- Alignment:
 - CMM
 - Fresnel zone plates and CCD camera (10 mm over 35 m)
 - Laser trackers (10 mm resolution)
 - Fiducials (3 mm repeatability)
 - LVDTs (5 mm resolution)





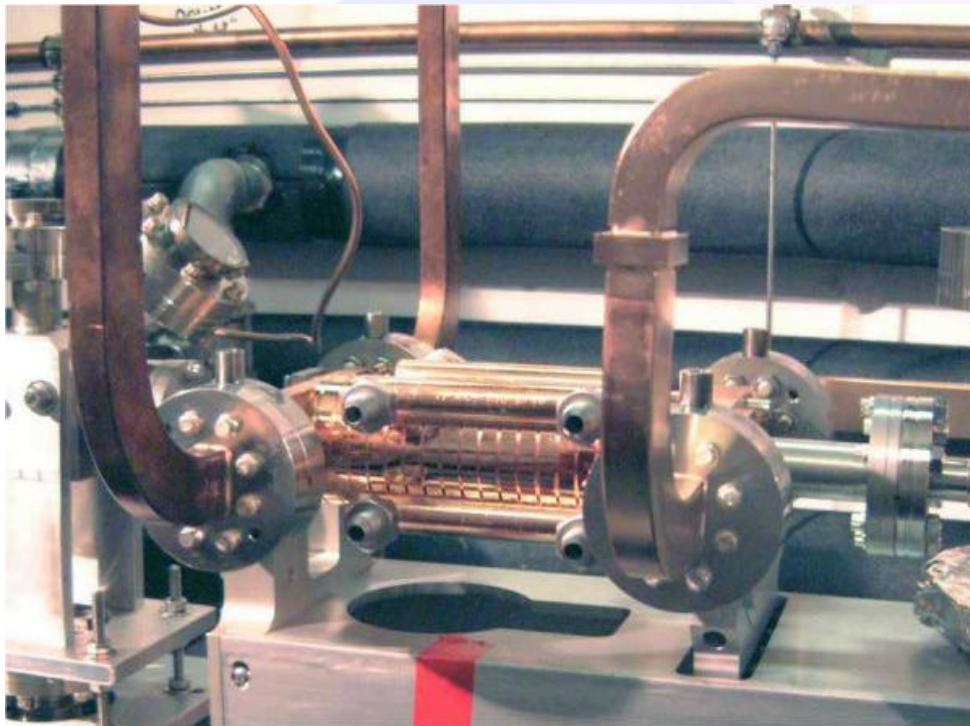
SLS Upgrade

- Alignment:
 - Laser interferometer
 - CMM
 - HLS (+/- 3 mm repeatability)
 - HPS (+/- 1 mm repeatability)





Design



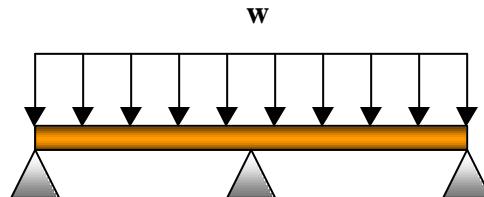
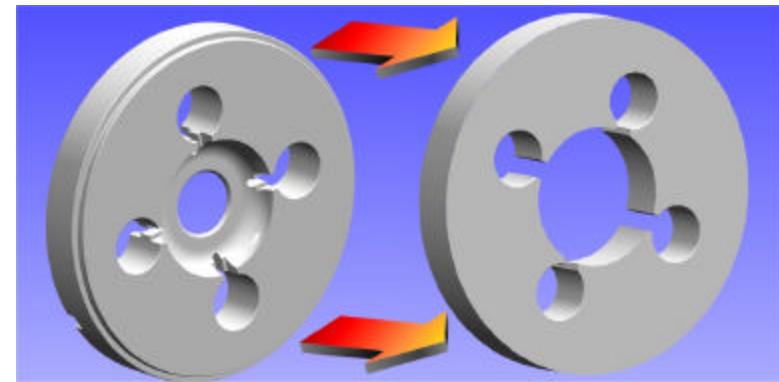
- Self weight distortion
- Thermal dilatation
- Micro Creep
- ...



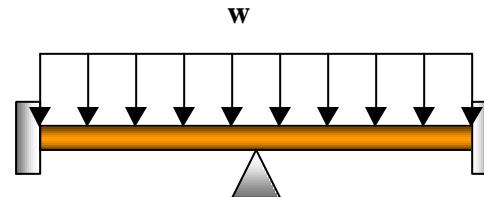
Self weight

-1-

- The presence of brazing material is not affecting the mechanical behavior of the structure.
- Nicoro-80 by Wesgo Metals. yield strength of 372 MPa and a thermal coefficient of expansion of about $17.8 \times 10^{-6} \text{ C}^{-1}$
- 61 mm RDDS disks



Model 1



Model 2



Self weight

-2-

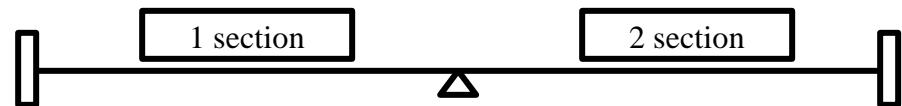
$$EJv^{iv} = w$$

$$v = \frac{1}{EJ} \left(\frac{wl^4}{24} + az^3 + bz^2 + cz + d \right)$$



<i>Start section 1</i>	<i>Connection</i>	<i>End section 2</i>
$v_1=0$	$v_1=0$	$v_2=0$
$v^{ii}_1=0$	$v_2=0$	$v^{ii}_2=0$
	$v^i_1=v^i_2$	
	$v^{ii}_1=v^{ii}_2$	

$$v = \frac{1}{EJ} \left(\frac{wz^4}{24} - \frac{wlz^3}{16} + \frac{wl^3z}{48} \right)$$



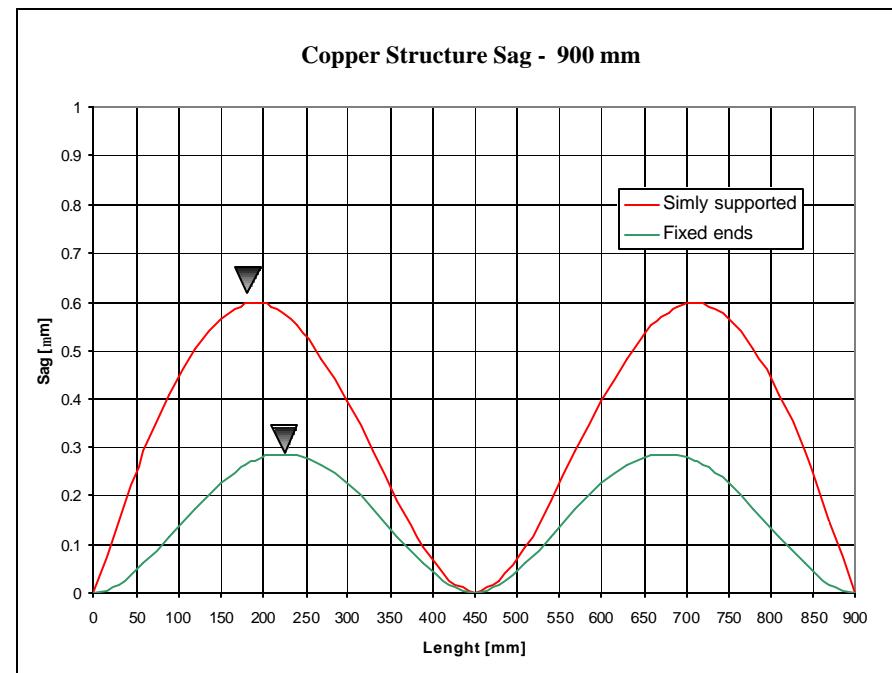
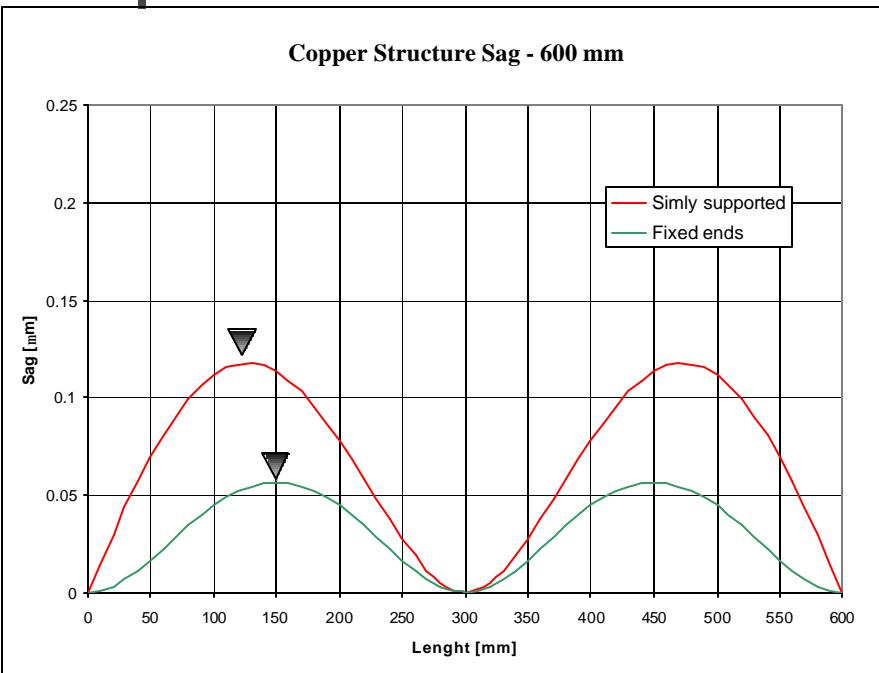
<i>Start section 1</i>	<i>Connection</i>	<i>End section 2</i>
$v_1=0$	$v_1=0$	$v_2=0$
$v^i_1=0$	$v_2=0$	$v^i_2=0$
	$v^i_1=v^i_2$	
	$v^{ii}_1=v^{ii}_2$	

$$v = \frac{1}{EJ} \left(\frac{wz^4}{24} - \frac{wlz^3}{12} + \frac{wl^2z^2}{24} \right)$$

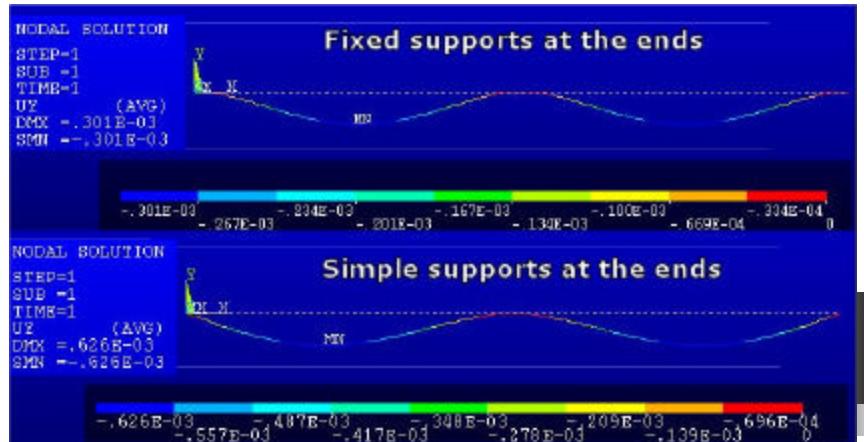


Self weight

-3-



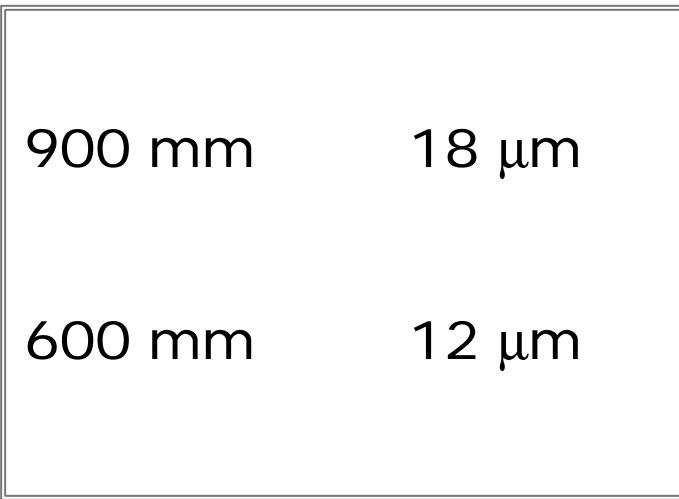
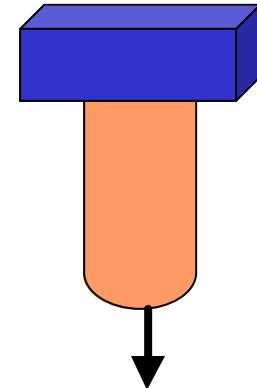
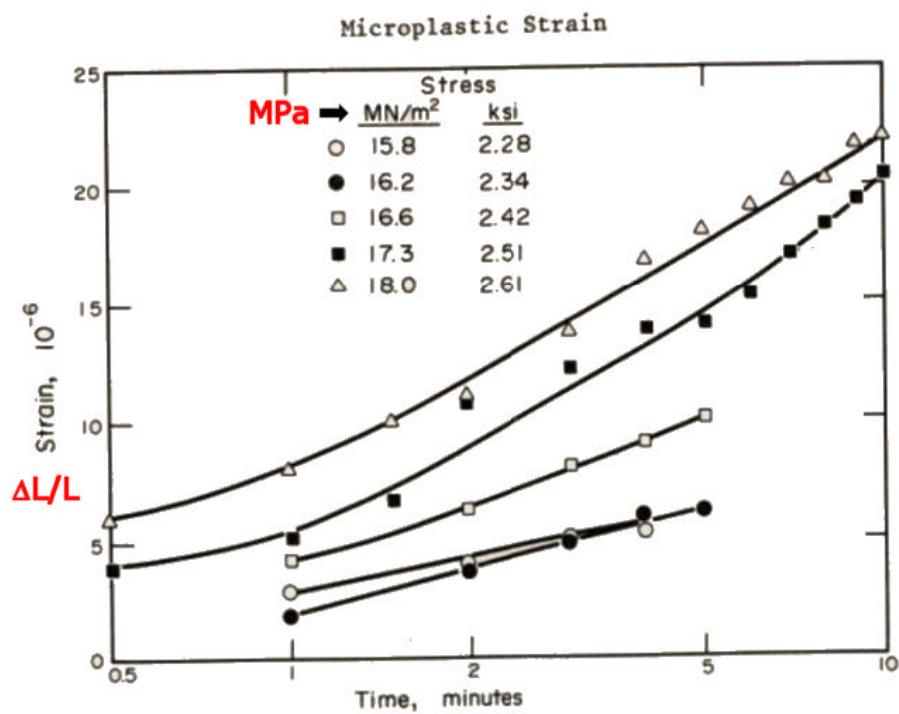
	600 mm [μm]	900 mm [μm]
Fixed ends	~ 0.06	~ 0.30
Simple ends	~ 0.12	~ 0.60

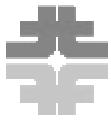




Thermal dilatation & Creep

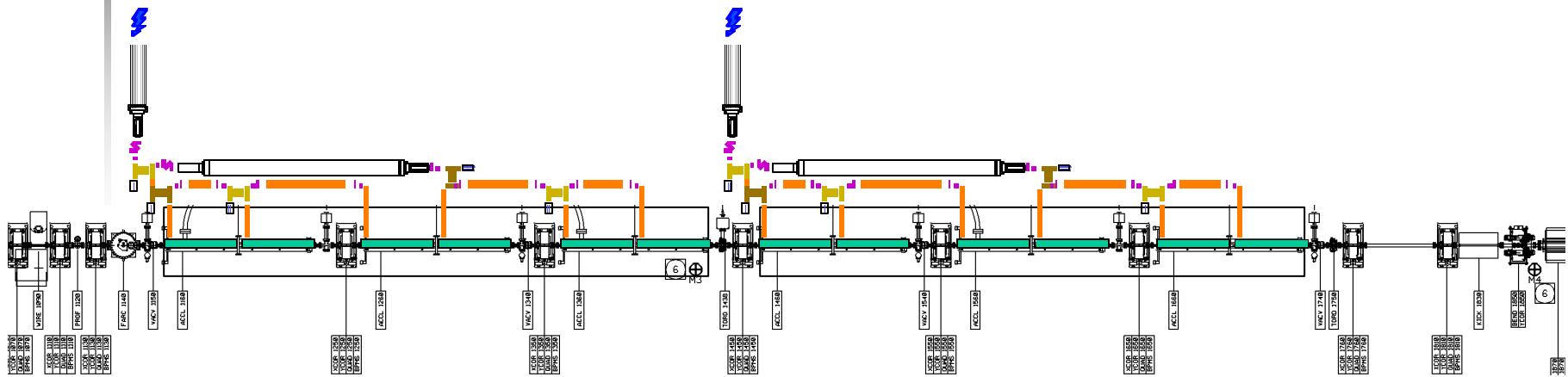
ΔT 25 [C]	Expansion 600 [μm]	Expansion 900 [μm]
Cu	204	306
Al	288	432





NLCTA

Eight-Pack Project Structures in NLCTA



Second Girder Installed

First Girder Installed (Feed by Long Delay Line)



First Support

- First task in the development of girders is the design of the supports for our first structure (FXB001) that will be tested in NLCTA next summer
- No moving parts, no tight tolerances
- Reduced dimensions in order to fit NLCTA space constrains
- Maximum of two structures per support

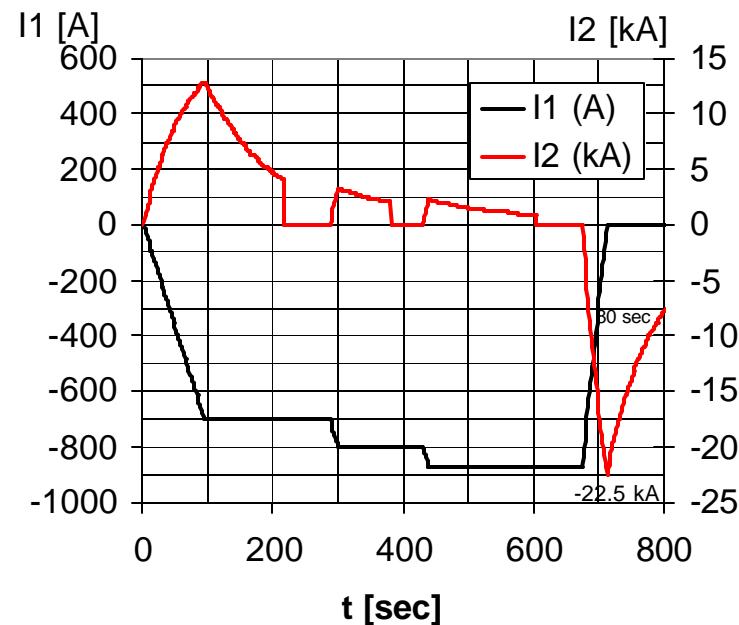
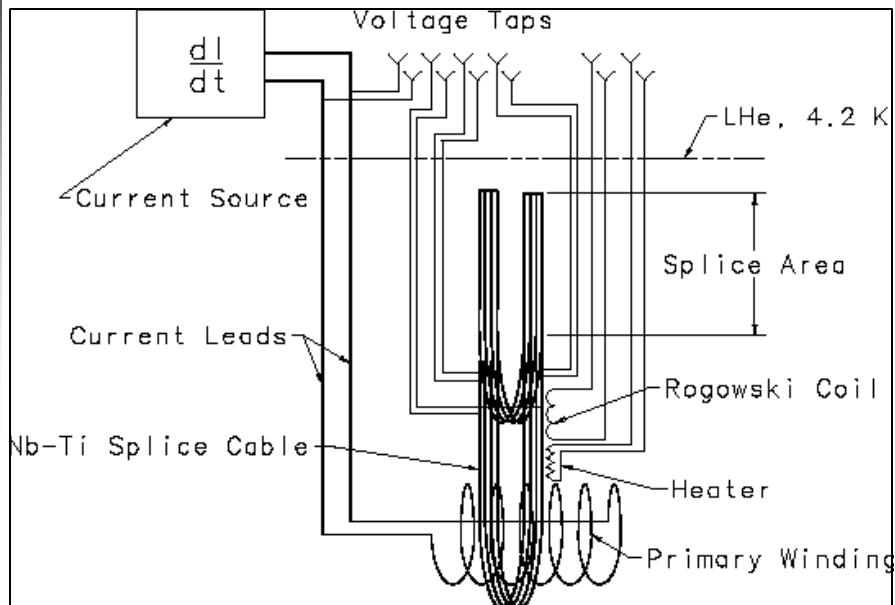


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Transformer



C.B





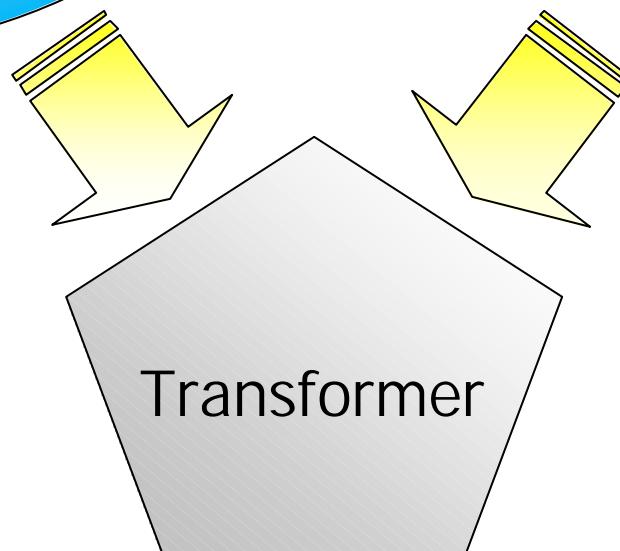
Transformer DAQ

Critical current:

- Voltage taps
- Current ramping
- Temperature meters
- Measurement protection

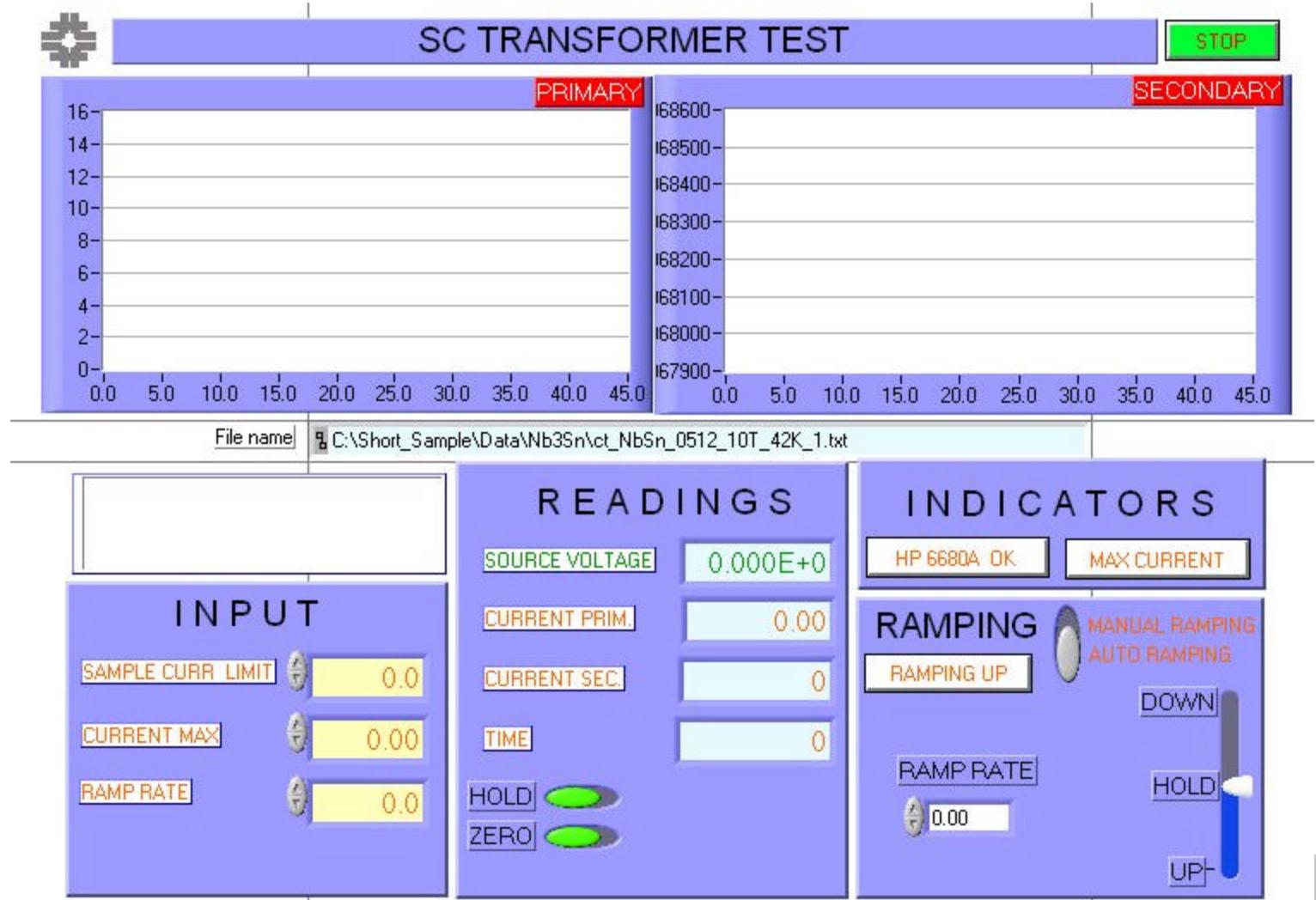
Magnetization:

- Integrated signal
- He level meter





Transformer DAQ





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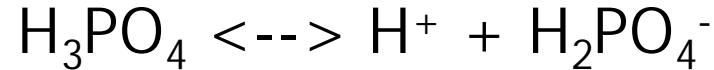
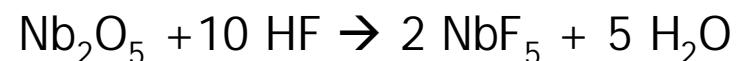
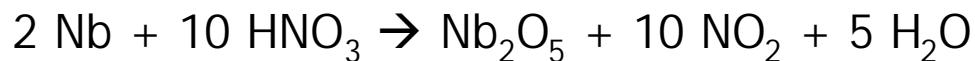


Chemical polishing of SCRF

To obtain optimal performances in a SC resonator, it is necessary to chemically etch away a considerable surface layer of $\sim 100 \mu\text{m}$

Buffered chemical polishing

1:1:2 HF (48%) HNO_3 (68%) H_3PO_4 (85%)





Chemical polishing of SCRF

Max Nb in solution 16 g/l → 25 l of mix for 100 mm

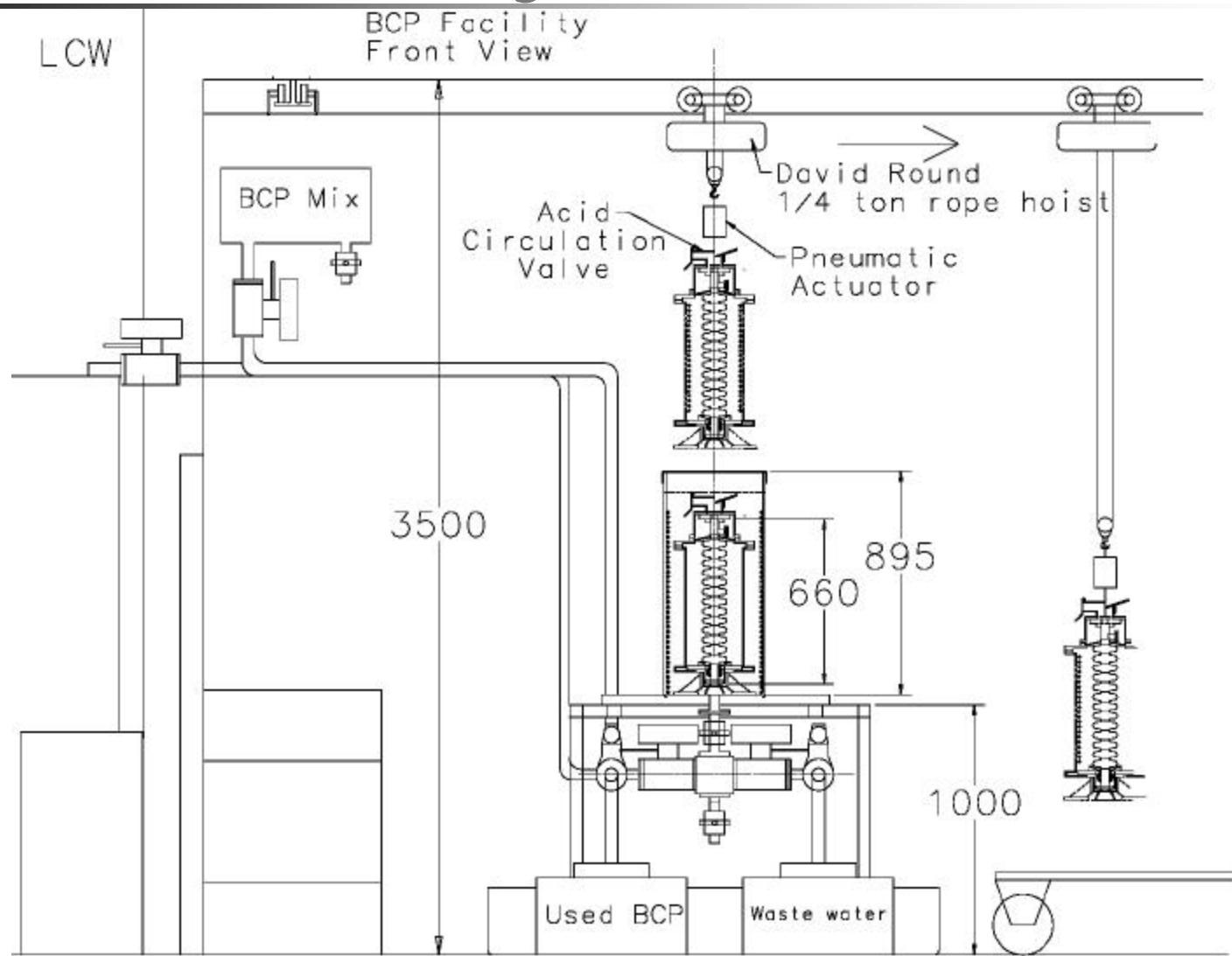
100 mm → 300 lit of NO₂ produced in 50 minutes

100 mm → 300 W of heat produced in 50 minutes

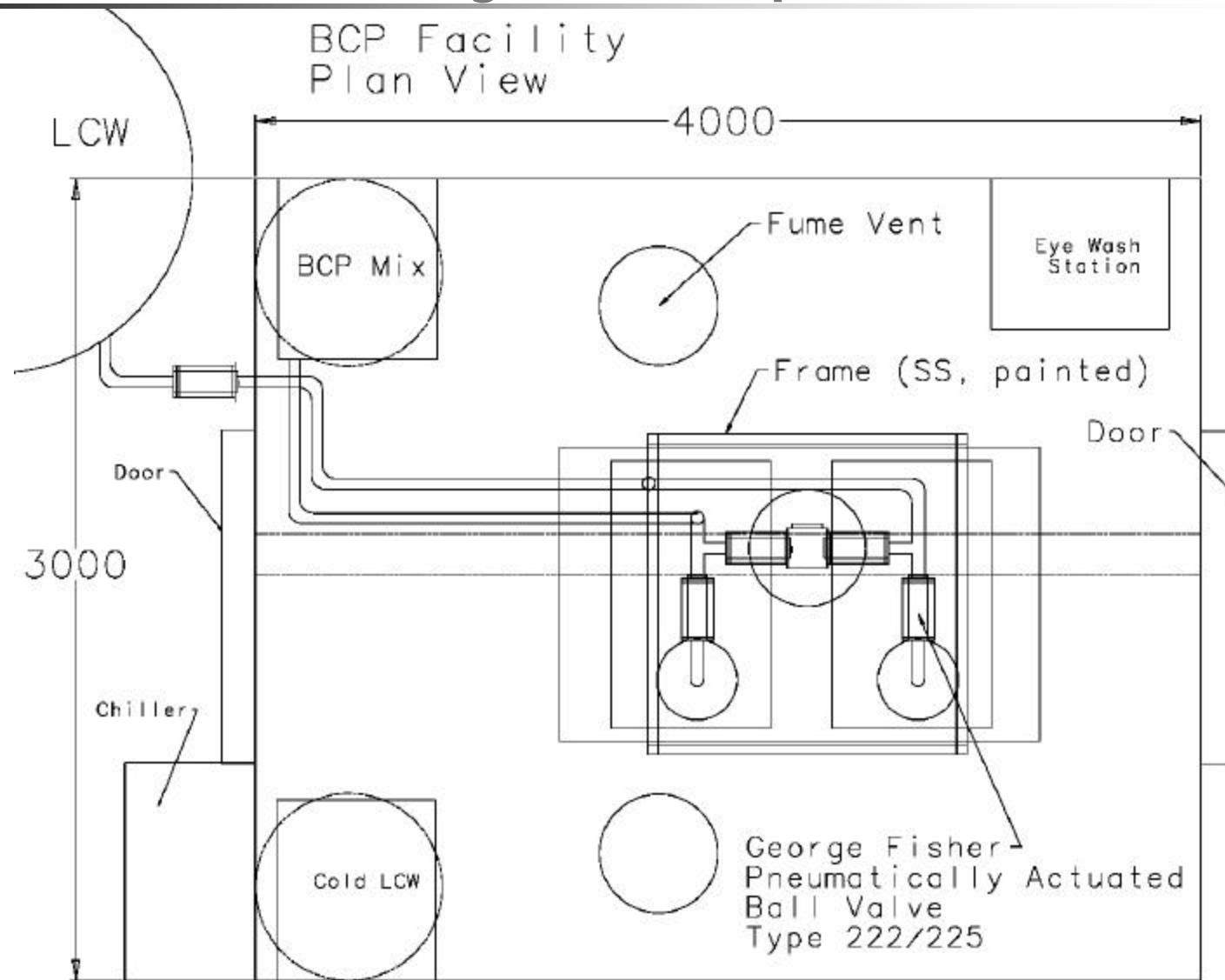
Amount of Nb has to be monitored and temperature kept constant in order to control the reaction at a rate of 2 µm per minute @ 20 C



BCP Facility -front view-

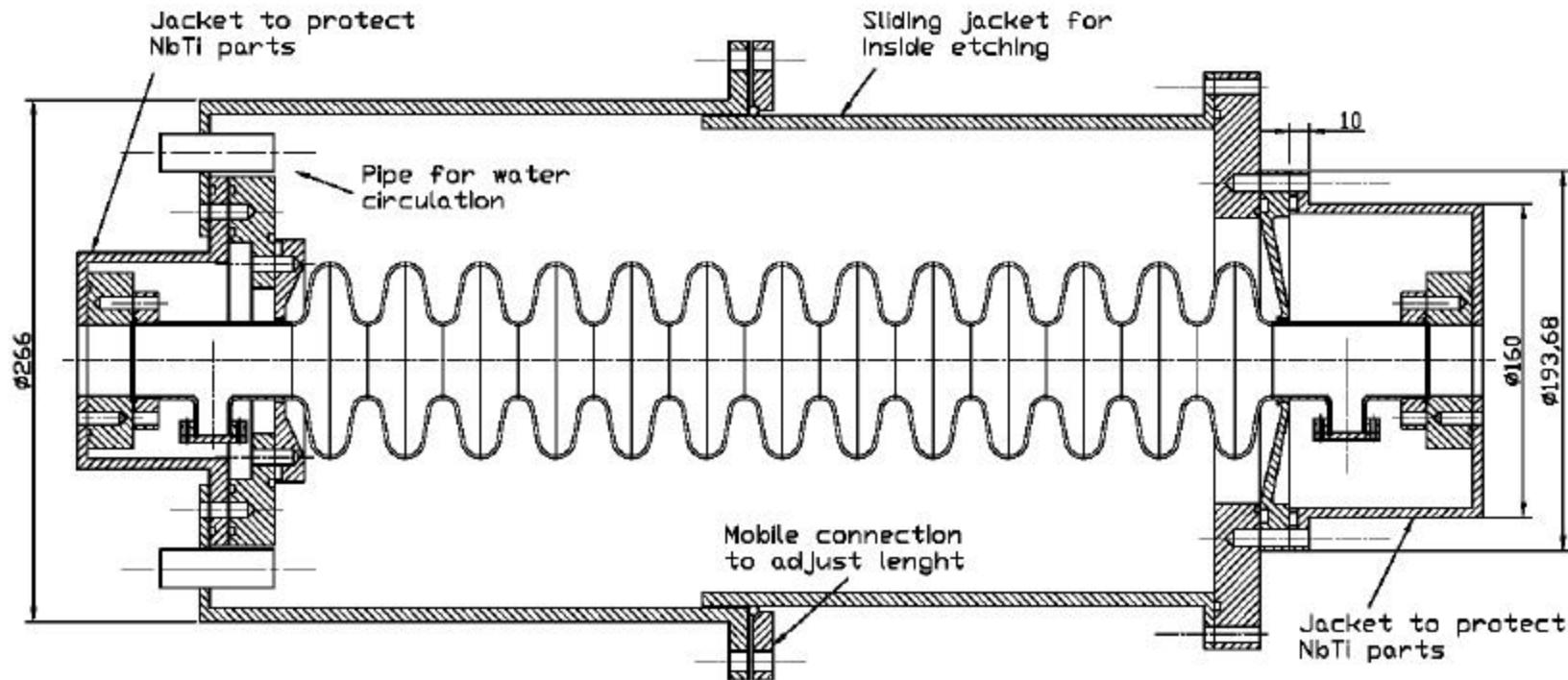


BCP Facility -plan view-





Jacket for resonator



All parts are PVDF.

The sliding jacket is removed during external etching.

During internal etching the jacket is filled with water.

During external etching the resonator is filled with water.

O-rings are to be replaced after every assembling operation.



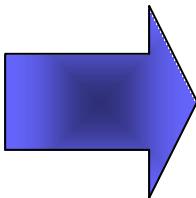
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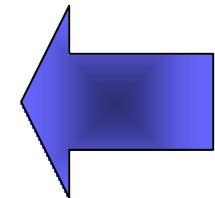


LC Group Web Site

Just Click here:

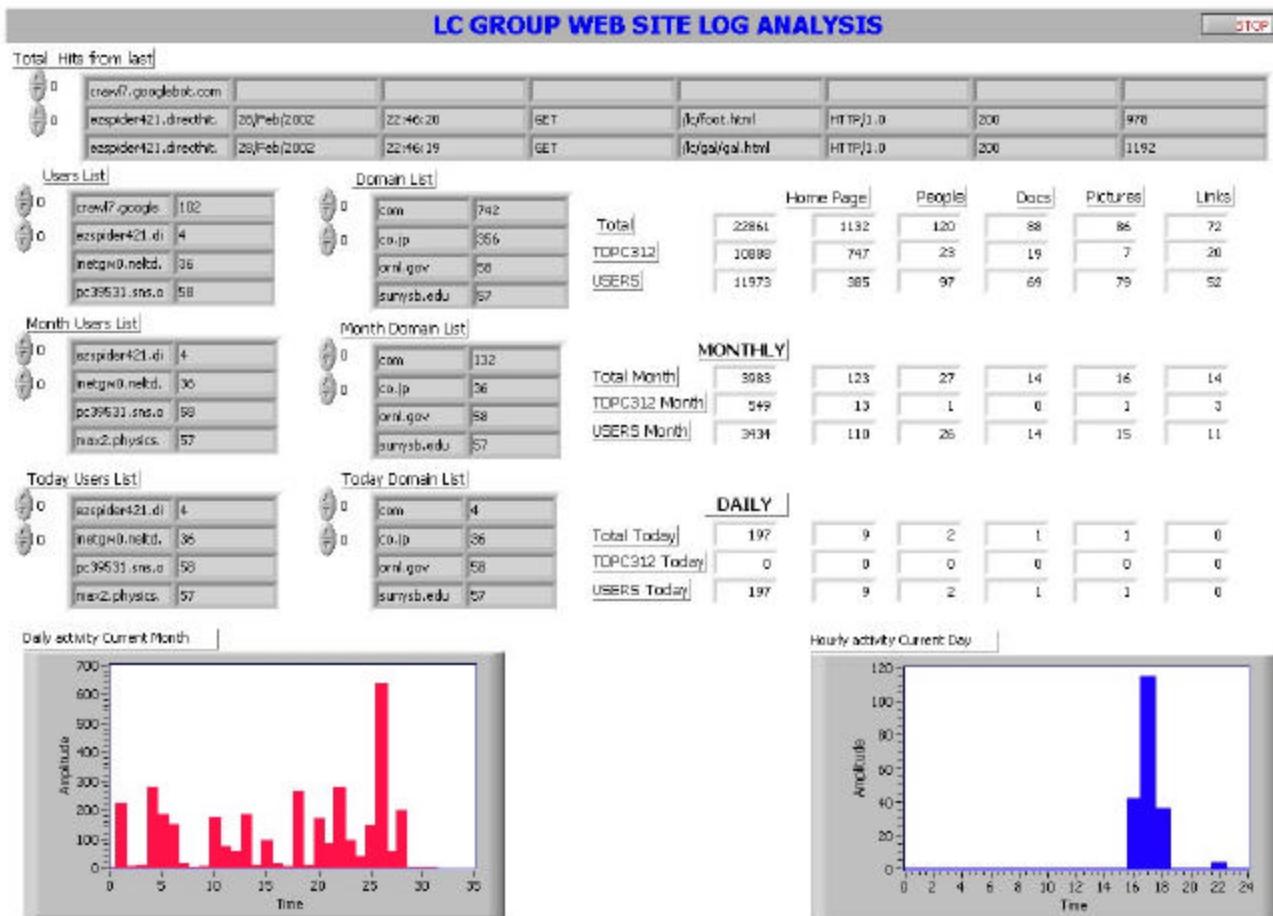


<http://www-td.fnal.gov/lc/intro.html>





LC Group Web Site: Statistics

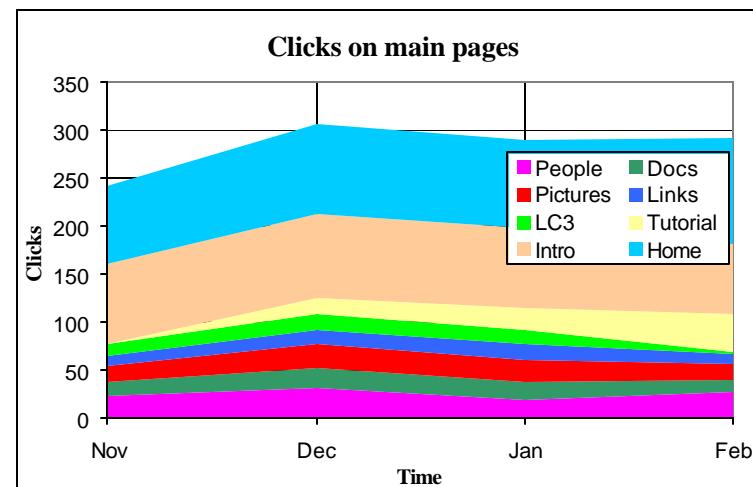
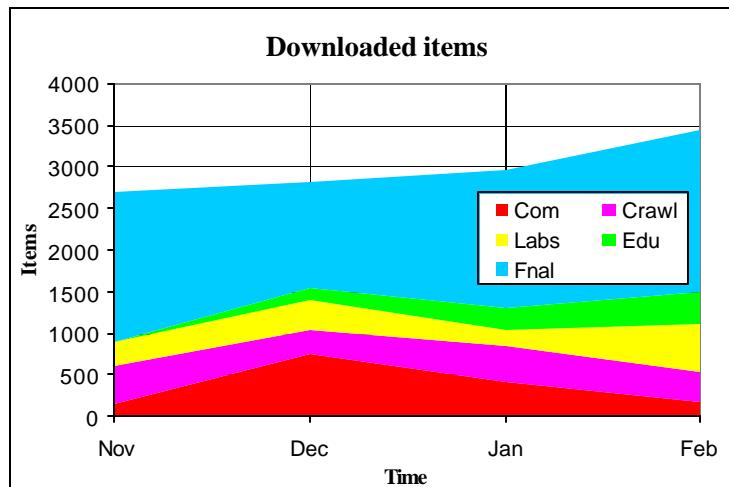




LC Group Web Site: Statistics

	Total	Fnal	Labs	Edu	Com	Crawl	X day
Nov	2703	1828	288	0	127	460	90.1
Dec	2810	1270	358	162	753	267	100.4
Jan	2961	1659	191	269	412	430	105.8
Feb	3434	1958	586	366	167	357	122.6
ToT	11908						

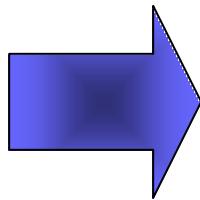
	Total	Home	People	Docs	Pictures	Links	Intro	LC3	Tutorial	X day
Nov	241	82	22	15	16	10	81	15	0	8.0
Dec	306	93	29	23	25	14	89	17	16	10.9
Jan	291	94	19	17	23	17	83	15	23	10.4
Feb	292	110	26	14	15	11	74	3	39	10.4
ToT	1130									



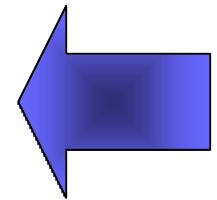


Kiosk interface

- Display for the linear collider group
- Kiosk



<http://tdserver1.fnal.gov/public/boffo/td01.swf>





Conclusion

**Why conclusion?
It is not much but
this is just the beginning!!!**