A Straight Section for C0

- Space for Testing BTeV Components
- Space for Staging BTeV Installation
  - Commissioning BTeV Components
    - Get BTeV operational sooner

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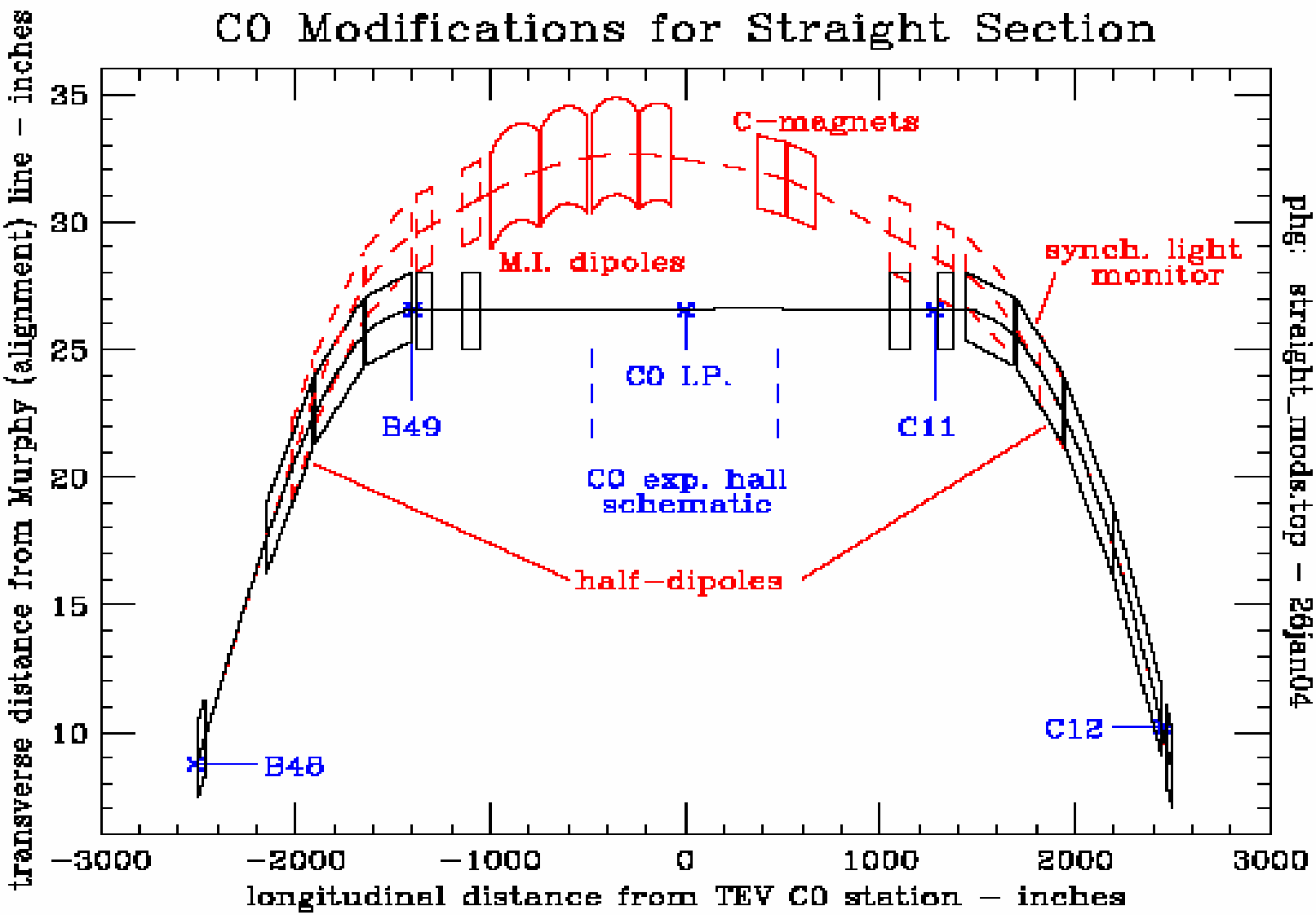
Motivation for an early straight section at C0

- Planned for 2005 shutdown (8 weeks).
- Provide space for BTeV to test and commission detector elements, especially pixel vertex detector, and observe beam environment, e.g. radiation backgrounds and E.M. pulse.
- Insert wire target in beam halo or turn separators off to generate low Luminosity collisions.
- There is not enuf space in C0 Assembly building to pre-stage entire experiment. Idea is to build and install individual pieces, as ready, each shutdown.
- Also: modify existing MR LCW to cool SM3 analysis magnet, B2 compensating dipoles, μ-toroid
- Start massive water cooled power bus installation

  extend over 2005 – 2008 shutdowns

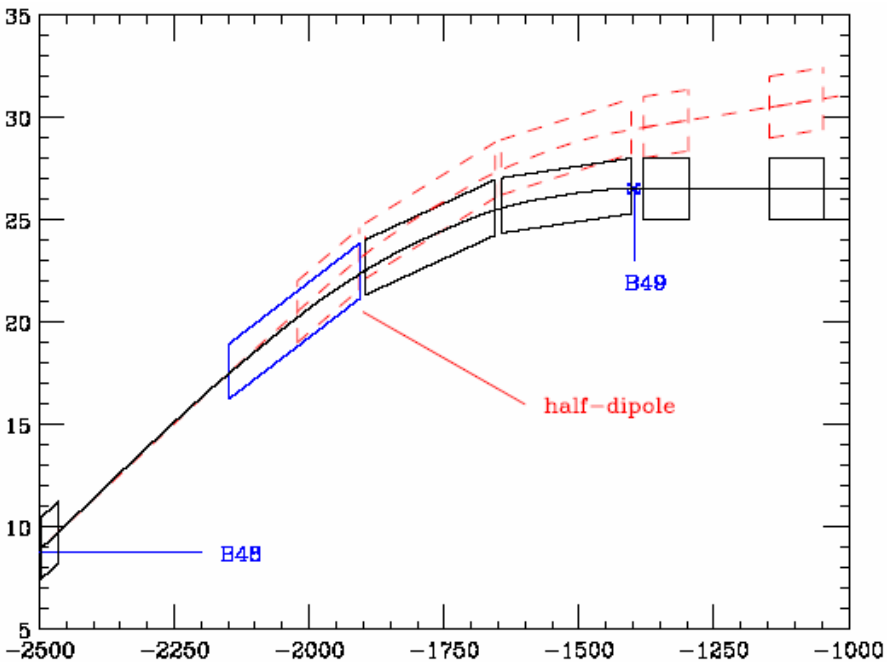
C0 Experimental Hall – showing abort elements - 1999 and 2003 Main Injector dipoles (insert)

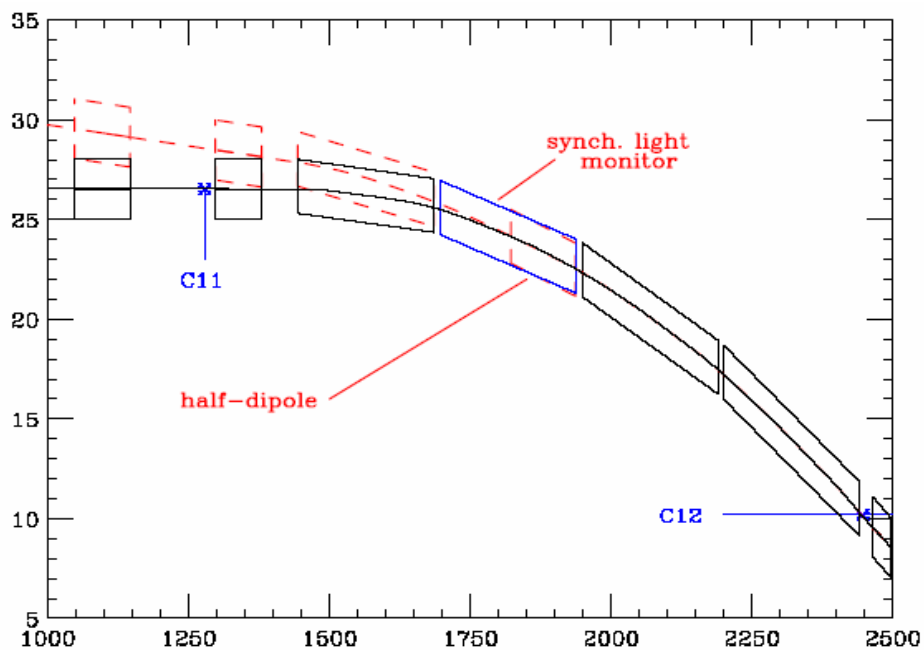
C0 Modifications for Straight Section



Zoom-in on modifications

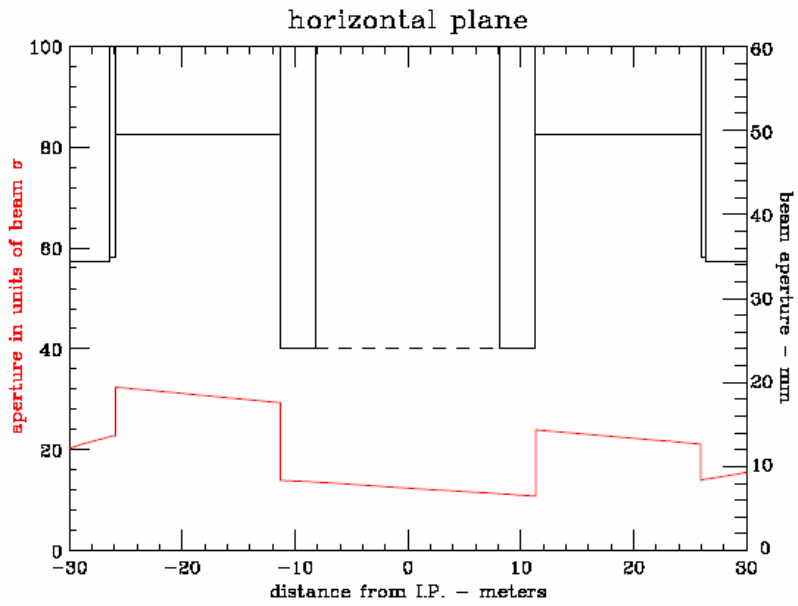
- Remove remnants of FT abort: 3 FMI dipoles, 2 C-magnets, 2 half-length Tevatron dipoles, & Synchrotron Light monitor
- Replace with 2 full-length dipoles & beam pipe
- Maximum transverse move ~ 4.2 inches (inward)
- Orbit length reduced by 1.6 mm Δf = 13 Hz, Δp = 13 MeV, reduces part of 39 mm mis-match with Main Injector ring

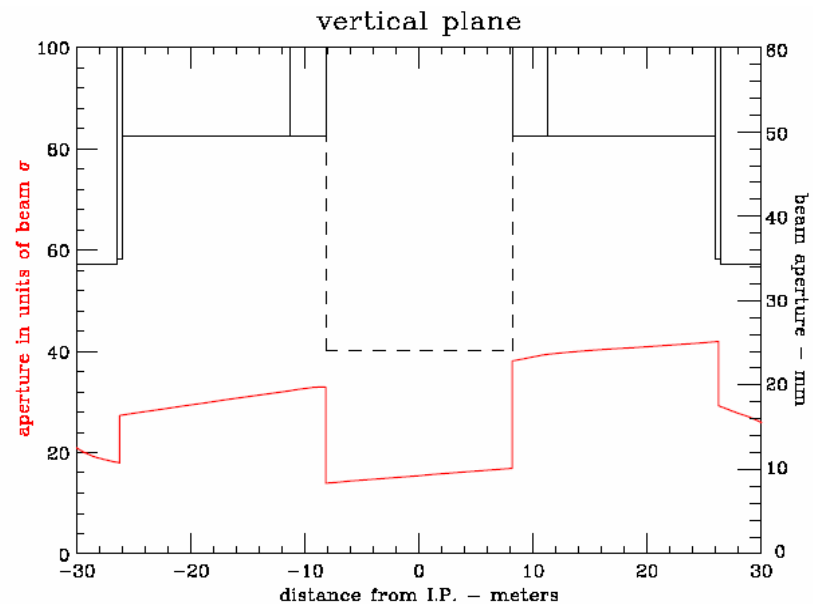




Injection Apertures in C0 Exp. Hall for Straight Section

- Horizontal aperture limit is 10.8 σ at downstream B2 magnet
- Vertical aperture limit is 13 σ at upstream 2" dia. beam pipe
- Tevatron limit of ~ 5 σ at F0 Injection Lambertson magnet





Tunnel Modifications

- Must interface with FESS Outfitting of Exp. Hall during an 8 week long shutdown in 2005:

  1st week: remove FMI & C-magnets & stands

  2nd-6th week: Exp Hall available to contractors

  7th-8th week: install vacuum pipe and bake-out
- Will isolate HVAC for Experimental Hall from that of Tevatron => ODH Class 0
  facilitating contractor & experimenter access
- Modification of MR LCW system to cool SM3 analysis magnet, B2 compensating dipoles, toroid, water cooled bus system, and HiTc power leads

LCW Requirements for BTeV Experiment

- Requires ~ 250 GPM for SM3, B2's, and μ-toroid magnets
- (plus ~ 450 GPM later for low-β insertion bus, PS, leads)
- Provided by Main Ring LCW pumps at B3, B4, and C1

System	Qty	Current	Power	Flow Requirement	Temperature Rise	Diff. Pressure Req'd
		A	*kW*	*GPM*	*F [C]*	*psi*
Vertex Magnet	1	4200	440	151	23 [13]	120
Vertex Power Supply*	2	-	35	11	-	100
Vertex Bus	1	4200	<5	5	<10 [6]	<100
Toroid Magnet	1	1500	25	25	8 [4]	120
Toroid Power Supplies	1	-	2	5.5	-	100
Toroid Bus	1	1500	<5	5	<10 [6]	<100
B2 Magnet*	2	2300	76	23.4	23 [13]	110
B2 Power Supply	1	-	6	5.5	-	100
B2 Bus*	2	2300	<5	11	<10 [6]	<100
		Total	**599**	**242**		

*- power and flow are for both units combined

LCW Requirements for Low-β Insertion

- Needed for low-β insertion – scheduled for 2009
- Should start installing water cooled bus earlier
- George Krafczyk discussed lengths of bus required

Element	Circuit #	Current	Total Flow Req'd	Diff. Pressure Req'd
		Amps	*GPM*	*psi*
C0 300 kW Power Supplies	1,2,3	10000	165	100
C0 2 5/8" Bus	1,2,3	10000	45	<100
B4 150 kW Power Supplies	4,5	5000	70	100
B4 2" Square Bus	4,5	5000	18	<100
C1 150 kW Power Supplies	10,11	5000	70	100
C1 2" Square Bus	10,11	5000	18	<100
C0 E.S. Separators (Load Resistors)	-	-	20	100
Cryogenic Leads**	-	-	50	<100
		Total	**456**	

**Single pair of leads: B45, B46, C14, and C15; Double pair of leads: B47, B48, B49, C10, C12, C13

Instrumentation, Controls, Vacuum, PS, QPM, Commissioning

- Add two new BPMs (H & V) inboard of Collins quadrupole magnet strings to trace trajectories through Experimental Hall and 3-bump
- Recommission Tevatron QPM for larger inductance (replaced 2 half-dipoles with 2 full-dipoles)
- Otherwise, existing controls, power supplies, and vacuum (10^{-9} torr) components are sufficient.
- Commission new BPMs and BLMs (position & loss)
- Train new full dipoles to 1010 GeV current level
- Optimize local orbit corrections (ramp & squeeze)

Required tasks for implementing C0 straight section

- Warm up cryo B4 and C1
- Unhook warm magnets, LCW, vacuum, tray, railings, etc.
- Open 400 ton shield door
- As found alignment check
- Remove 2 C-magnets
- Remove 4 FMI – riggers
- Remove 61 blocks – riggers

  C0 outfitting can start
- Remove 2 half-dipoles, and 2 warm bypasses
- Undo 17 cryo interfaces
- Reposition 3 cryo dipoles, 4 cryo quads, 6 cryo boxes
- Add 2 full cryo dipoles and 1 standard cryo bypass
- Rough alignment setting
- Add 2 Beam Position Monitors
- Extend cryo piping - fitters
- Make-up 16 cryo interfaces and leak check
- Hookup Tev bus – electricians
- Warm vacuum pipe: install, leak check, bake-out
- Final alignment setting
- Tunnel isolation walls/doors
- Close 400 ton shield door
- Cool down cryo B4 and C1

  in parallel with
- LCW mods to BTeV - fitters
- Start long-term installation of w.c. power bus - electricians