Sector 1 Instrument Relocation for LEReC

June 5, 2015

Systems in the LEReC Region (39m - 64m) to be Relocated

7 separate assemblies	New Location	Champions	Approved
ARTUS Kickers - Blue V, Yellow H	Sector 2	Drees	Drees/Mernick
IPMs - Blue H, Yellow V	Sector 12	Tepikian	Tepikian/Minty
Moveable BPM & LF Schottky	Sector 1 (closer to Q4)	Brown/Blaskiewicz	Brown/Blaskiewicz
BBQ Kicker stripline (1m) YO1	Sector 2	Marusic	Minty/Mernick
Triple Purpose Pick-Up YO1 ~42m	Sector 2	Minty/Marusic/Blaskiewicz	Mernick/Blask
Quad Pick-up	Sector 2	Minty	Mernick/Minty

Cable Tray Waterfall

Systems to be Removed

Electron Detectors (8)	Zhang/Blaskiewicz	Blaskiewicz
Luminescence Monitor Cross at B02 53.1m	Minty	Minty
Stochastic Cooling Ceramic Pick-Ups[6-9 GHz] sector 1 & 2	Mernick/Brennan/Blaskiewicz	Mernick/Blask

Minutes from Sector 1 Relocation Meeting, May 22nd 9:15 LCR

D. Gassner (**Updated Minutes after June 5th Mechanical Topics meeting**)

- K Mernick suggest moving the BBQ kicker, Quad Pick-up and triple purpose pick-up assemblies to sector 2, yellow (it appears that there is room). This allows shorter cable lengths, moving towards YO1 Q4 would have meant (undesirable) longer cables than the existing. (this was later implemented)
- K Mernick suggests that we don't need the moveable X-Y capability on the triple purpose pick-up, this can simplify the relocation effort and beam line assembly. (this was later retracted, decide to keep existing motion features if needed in the future)
- Can remove the stochastic cooling ceramic pick-ups [6-9 GHz] in sector 1 & 2 since these are no longer used.
- The preference is for the IPMs to be installed as close to Q3 as possible in sector 12. Since they need to be offset because the beam pipes are close together, the horizontal should be closer to Q3. Jesse working on layout of new IPM locations (plan view) with longitudinal offset and separate stands for review.
- George suggests prioritizing the order of the installations and a bake-out schedule, see next comment.
- Need to get Mike Mapes & Dan Weiss involved as soon as possible for vacuum, mechanical and bake-out planning. (Vacuum Group plans to size interconnect beam pipes and bellows after devices are reinstalled)
- Rob M is following up with Angelika regarding beta function considerations of the new proposed locations of the ARTUS kickers adjacent to the existing ones in sector 2. (Proposed ARTUS locations later determined to be OK)
- Confirmation that GOF magnets will stay in sector 1 (near Q3), need to check with Gary W's latest LEReC layout. (This was later confirmed to be OK)
- Joe T indicated designer Vito committed for this priority and need dedicated mechanical engineers. (Vito plans to start creating 3D Pro-E drawings when he returns from vacation June 12th)(Ammar M & Taylor C plan to help as needed)
- Dan Lehn will start to order Rexroth stand materials to prepare for the new device stand modifications.
- System Champions need to approve the relocation plan for their respective systems. (This completed June 3rd)
- Warm Space Committee needs to approve the relocation plan. (Have verbal from Dan T at May 2nd meeting)

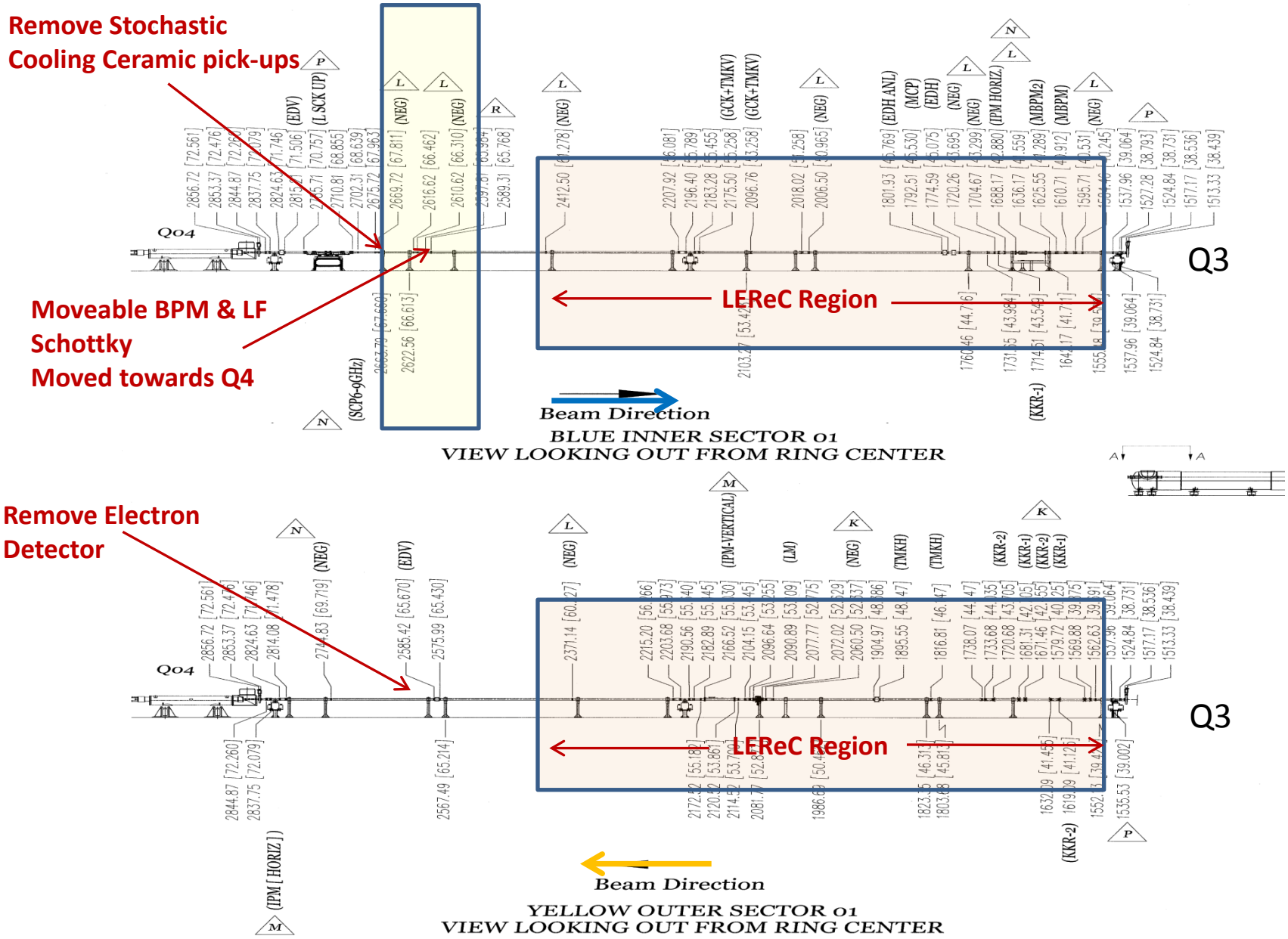
Next six slides are the Allotment Drawings

- **Sector 1 Before Relocation**
- **Sector 1 After Relocation**

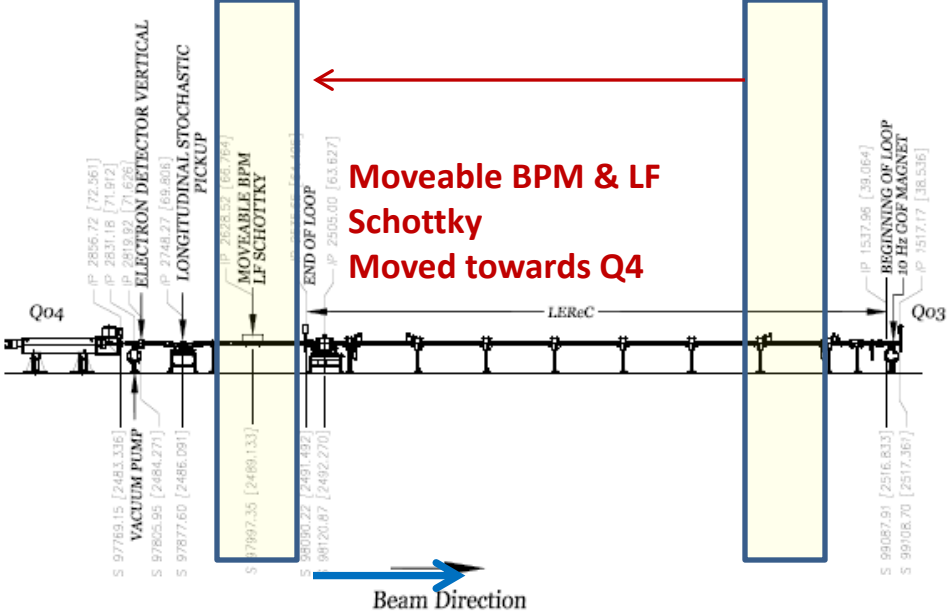
- **Sector 2 Before Relocation**
- **Sector 2 After Relocation**

- **Sector 12 Before Relocation**
- **Sector 12 After Relocation**
  - courtesy Vito De Monte

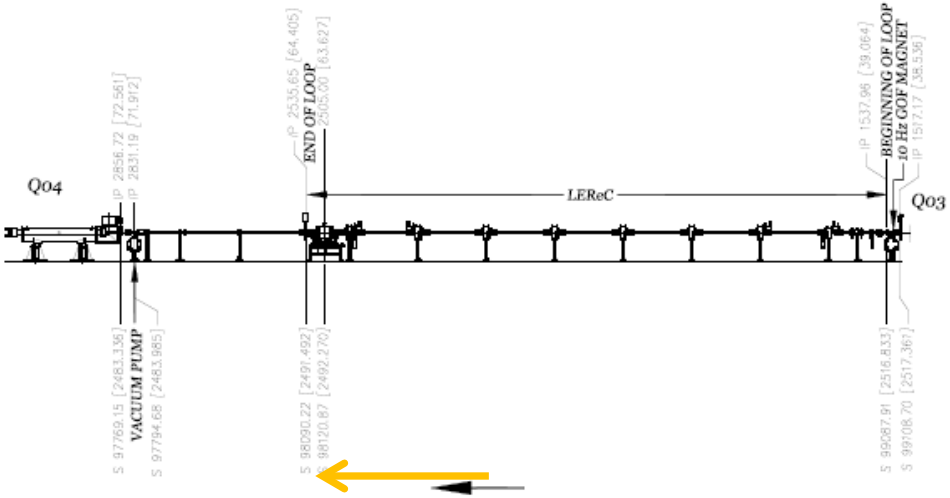
Sector 1 Before Relocation



Sector 1 After



BLUE INNER SECTOR 01
VIEW LOOKING OUT FROM RING CENTER

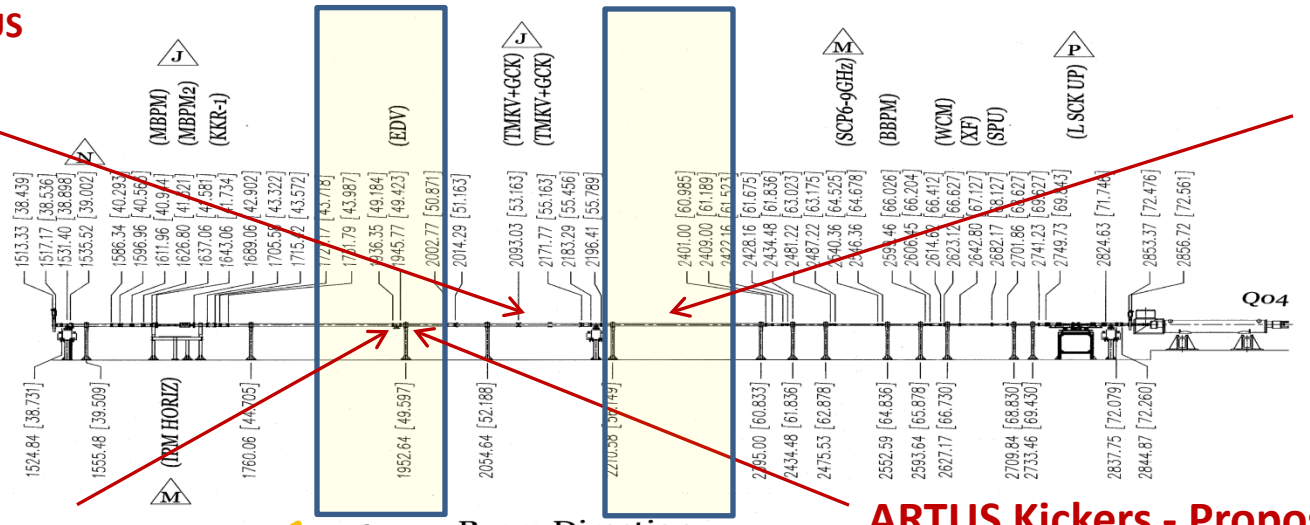


YELLOW OUTER SECTOR 01
VIEW LOOKING OUT FROM RING CENTER

Sector 2 Before Relocation

Existing ARTUS V Kicker

Use open space for Moveable Pick-ups & BBQ Kicker



Remove Electron Detector For ARTUS H Kicker

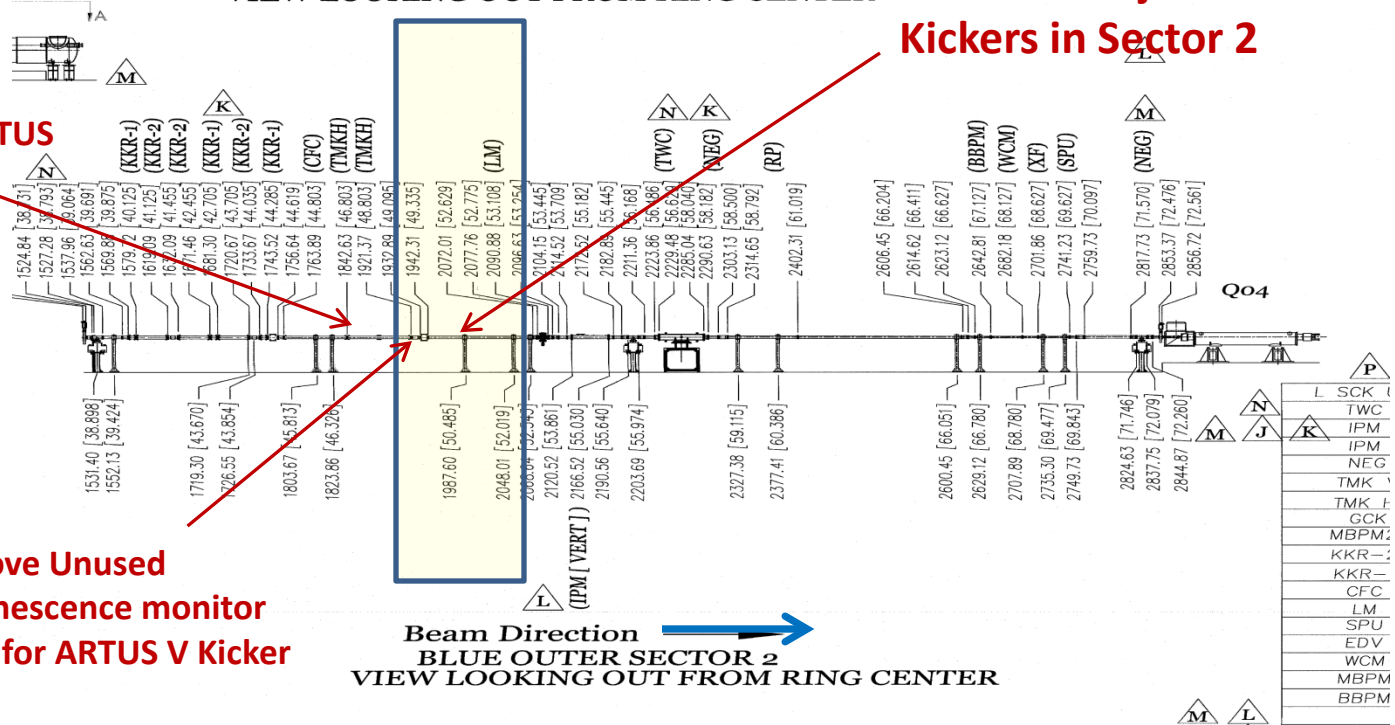
Beam Direction

YELLOW INNER SECTOR 2

VIEW LOOKING OUT FROM RING CENTER

ARTUS Kickers - Proposed new locations adjacent to existing ARTUS Kickers in Sector 2

Existing ARTUS H Kicker



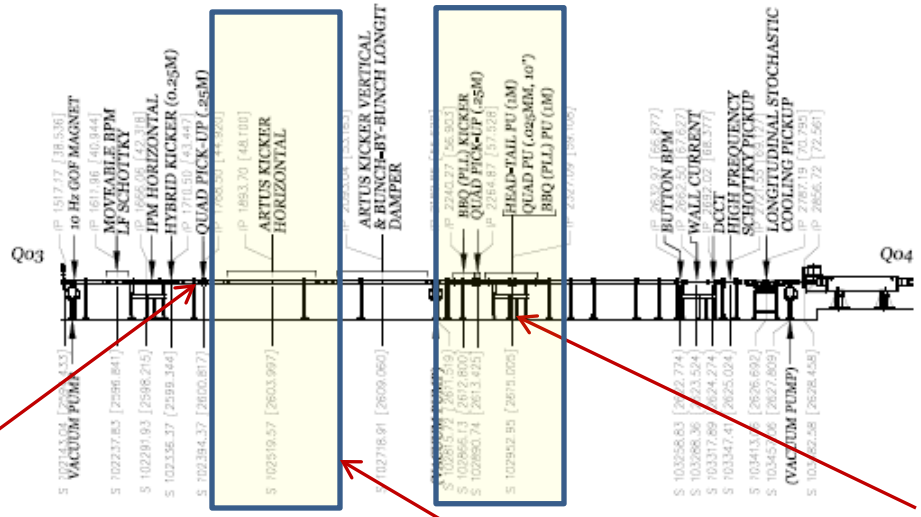
Remove Unused Luminescence monitor cross for ARTUS V Kicker

Beam Direction

BLUE OUTER SECTOR 2

VIEW LOOKING OUT FROM RING CENTER

Sector 2
After

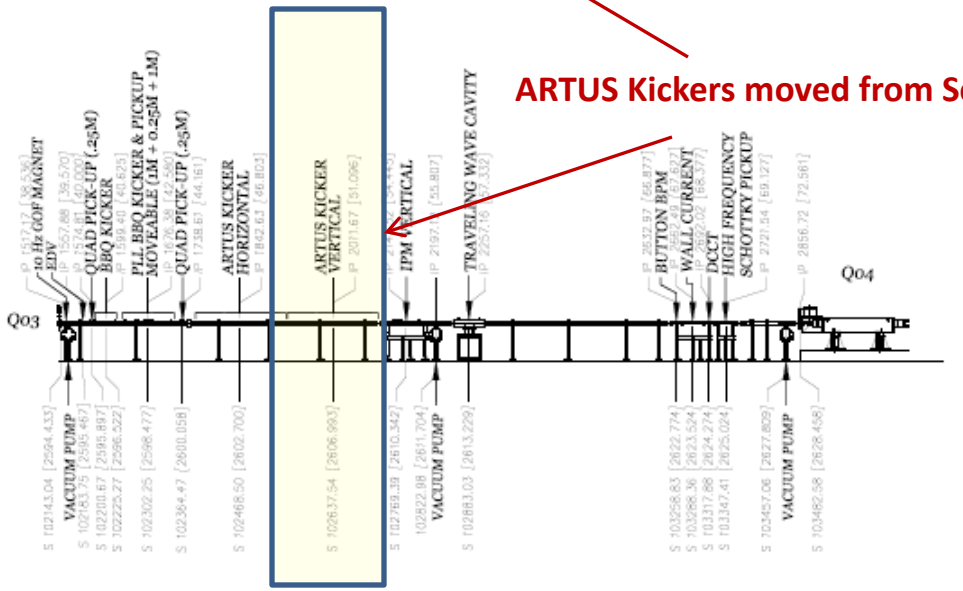


Quad Pick Up (0.25m)

Beam Direction
YELLOW INNER SECTOR 2
VIEW LOOKING OUT FROM RING CENTER

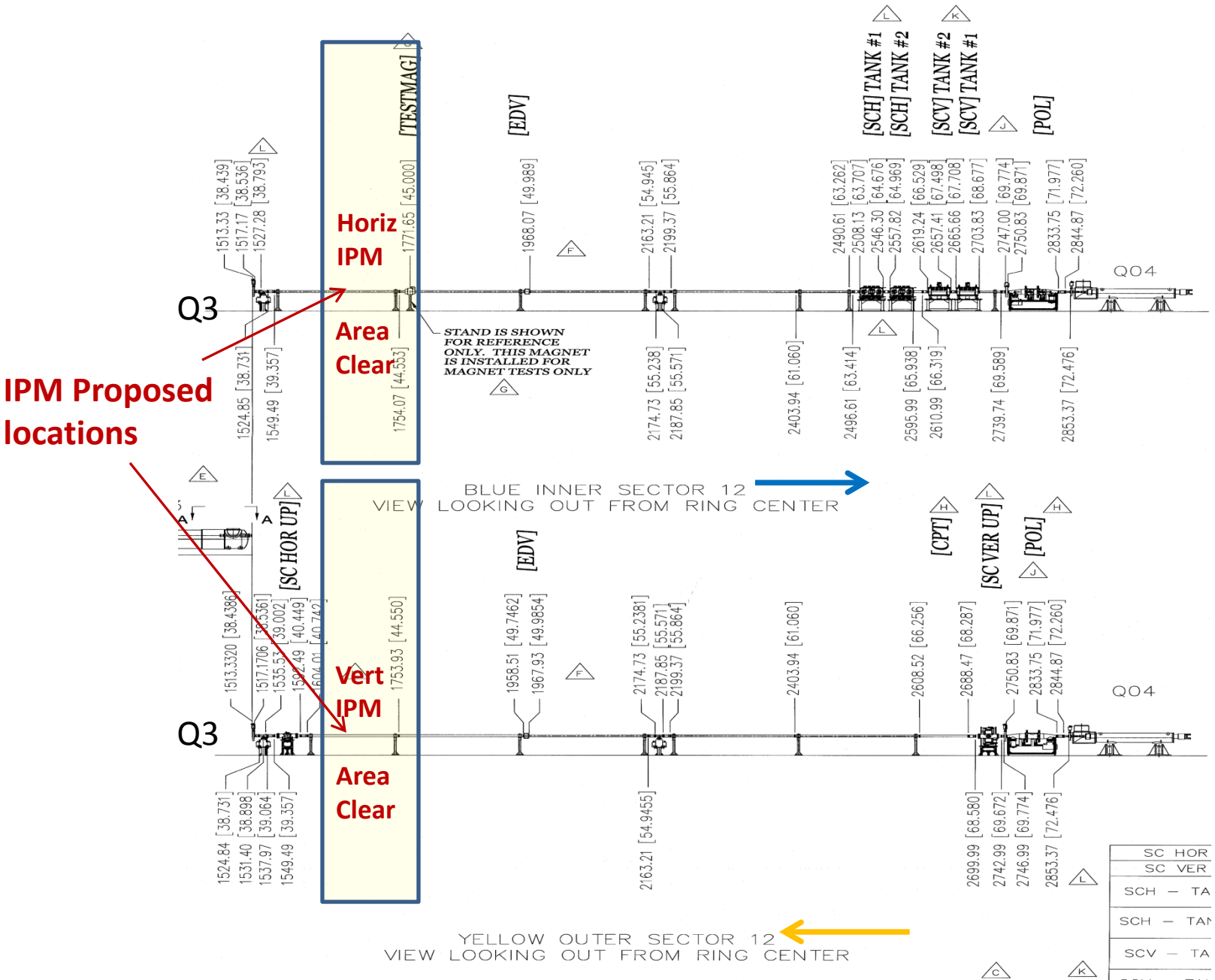
BBQ Kicker, Quad Pick-up & Moveable Pick-ups

ARTUS Kickers moved from Sector 1



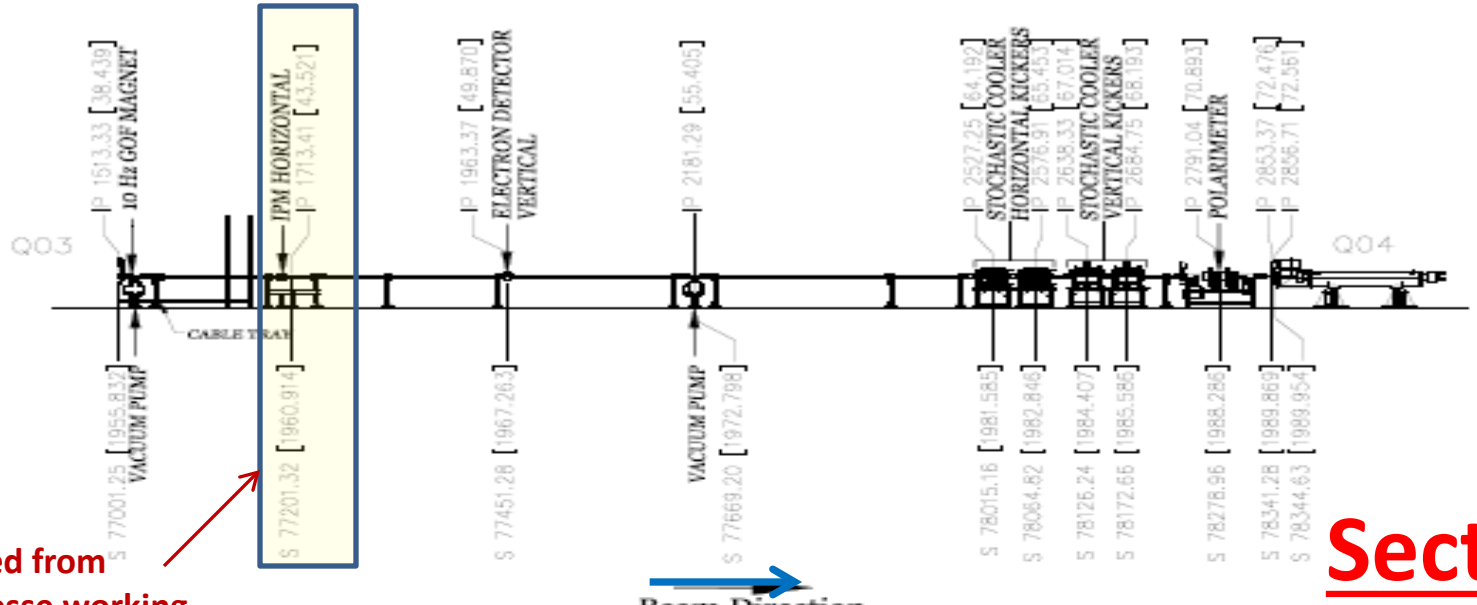
Beam Direction
BLUE OUTER SECTOR 2
VIEW LOOKING OUT FROM RING CENTER

Sector 12 Before Relocation



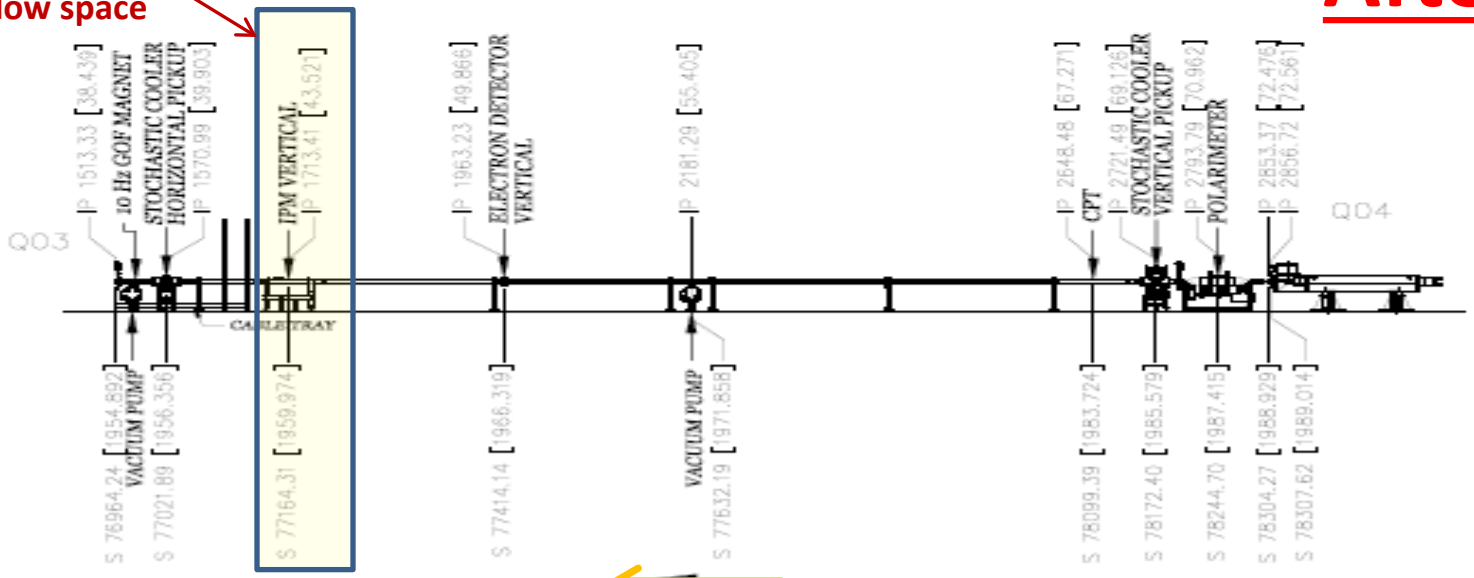
Sector 12 After

IPMs moved from Sector 1, Jesse working On final location, slightly offset to allow space for stands



Beam Direction

BLUE INNER SECTOR 12
VIEW LOOKING OUT FROM RING CENTER



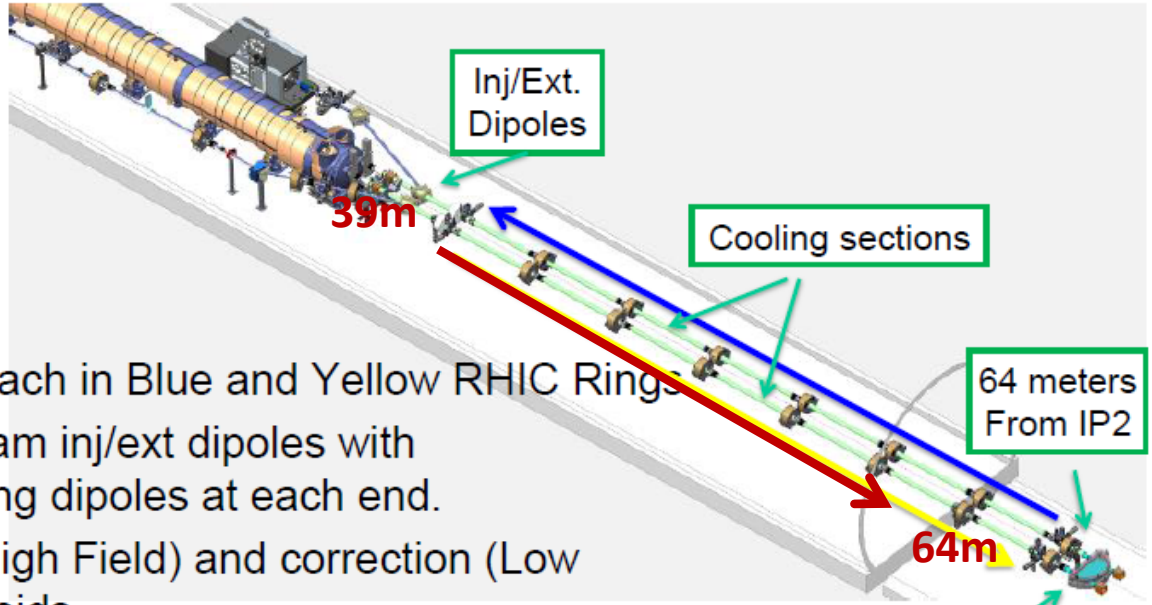
Beam Direction

YELLOW OUTER SECTOR 12
VIEW LOOKING OUT FROM RING CENTER

Sector 1 Instrument Relocation for LEReC

About 25m of RHIC transport (from 39-64m from IP2) needs to be cleared out soon after Run15 ends so the LEReC beam lines can be installed.

LEReC Phase-I layout: cooling sections in RHIC



- 18 Meters each in Blue and Yellow RHIC Rings
- Electron beam inj/ext dipoles with compensating dipoles at each end.
- Matching (High Field) and correction (Low Field) solenoids.
- RHIC "warm" beam tube with NEG coating and μ metal shielding.

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Office of Science U.S. DEPARTMENT OF ENERGY

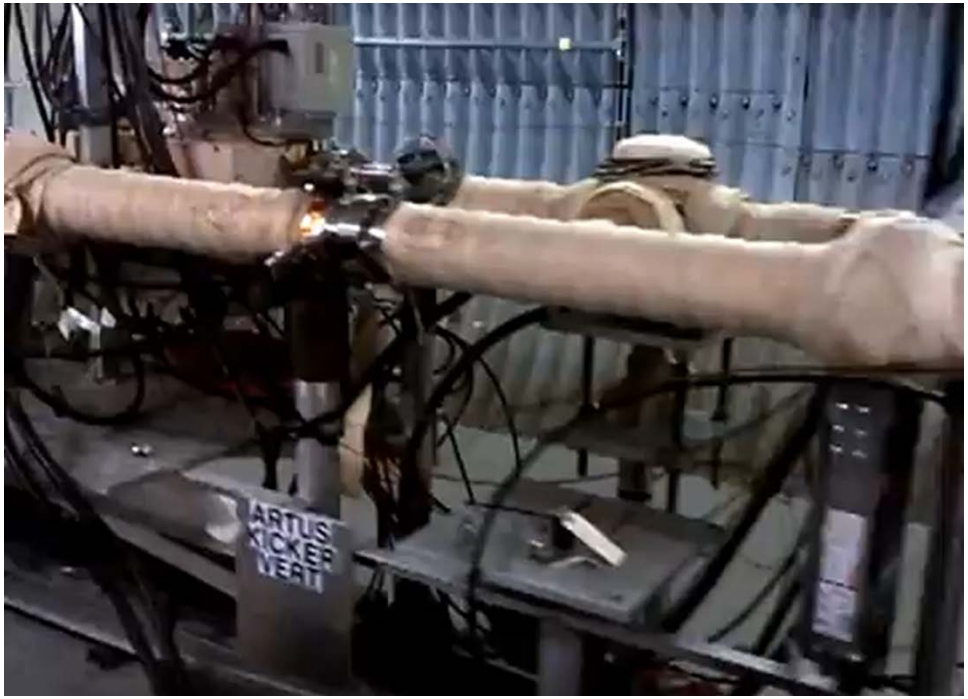
May 11 2015

Courtesy A. Fedotov

ARTUS Kickers

- 1 Horizontal kicker and 1 Vertical kicker Assembly
- Each Assembly consists of two sets of 2 meter long strip lines
    - 7/8” and 3/8” Heliax cables
- Move to Sector 2, adjacent to existing ARTUS kickers

<u>Multi-use Striplines:</u>
Tune Meter Kickers
Longitudinal Damper
Injection Damper
Gap Cleaning



Champion: Drees

Ionization Profile Monitors

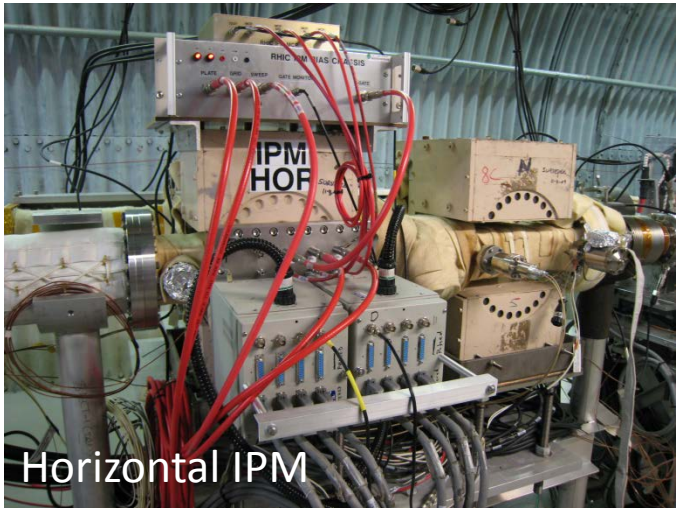
Michiko evaluated options for the IPMs:

Relocation of BH and YV IPMs:

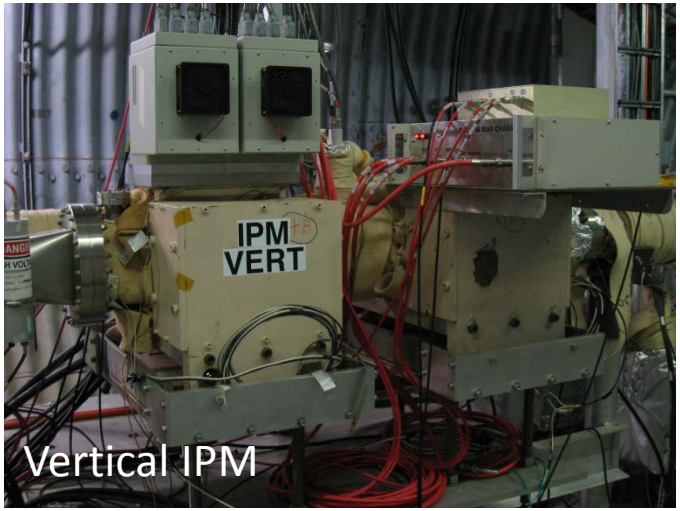
to sector 2 ok for LEReC and 100 GeV p+p.

to sector 12 required to resolve profiles for 250 GeV p+p.

After consultation with Wolfram (03/16/15), IPMs will be relocated to sector 12.



Horizontal IPM

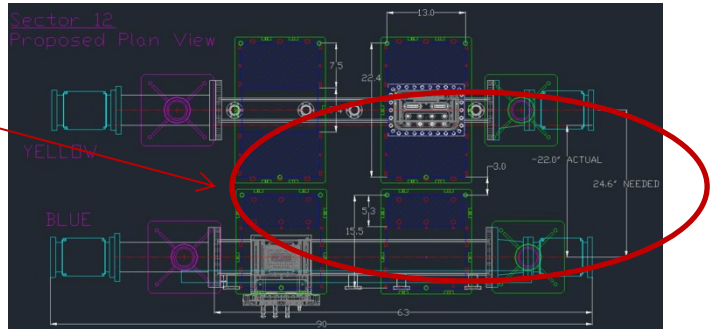


Vertical IPM

Electronics will be moved from 1002 to 1012

Each IPM has ~30 cables

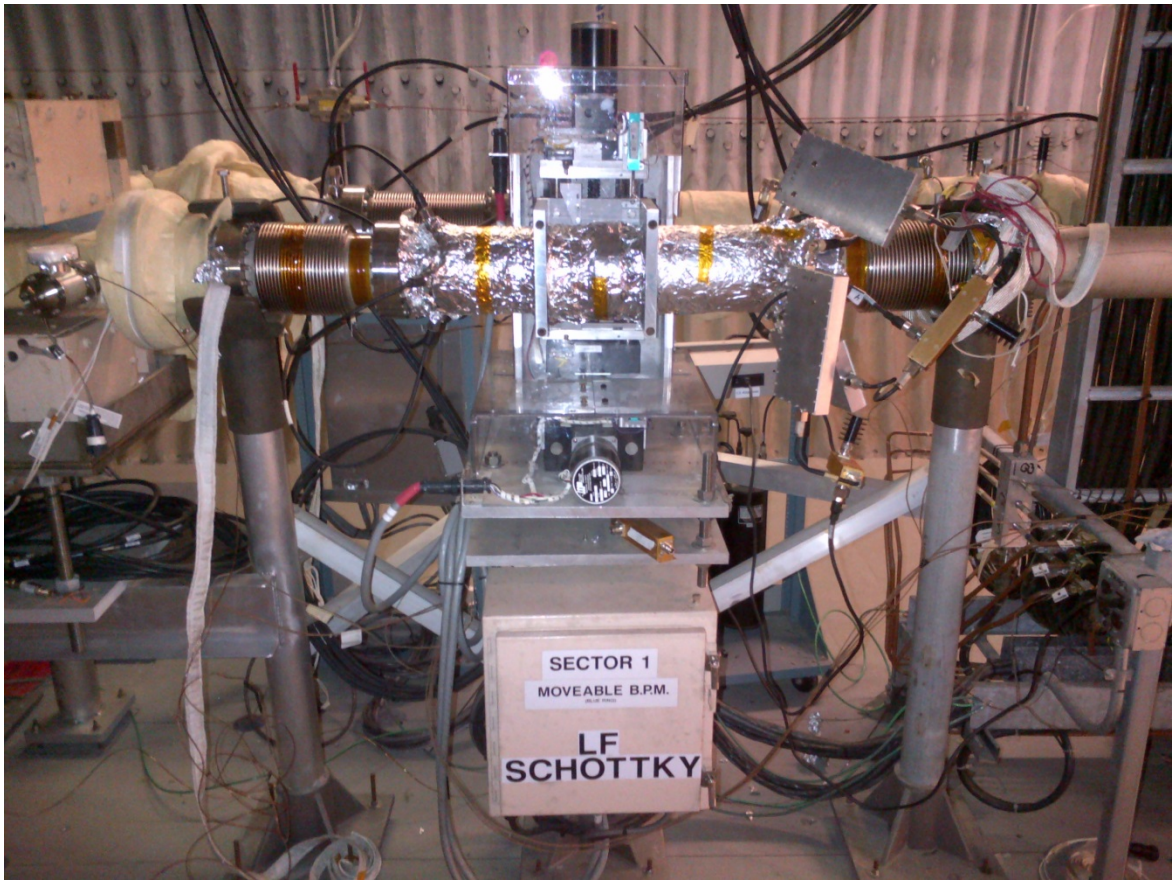
A common stand for both IPMs in sector 12 was considered until Jesse found a conflict. Present plan is for separate stands with the IPMs offset enough for clearance.



Champion: Tepikian

Moveable BPM & LF Schottky

Move from BI1 41m (from IP2) to 65m (closer to Q4)



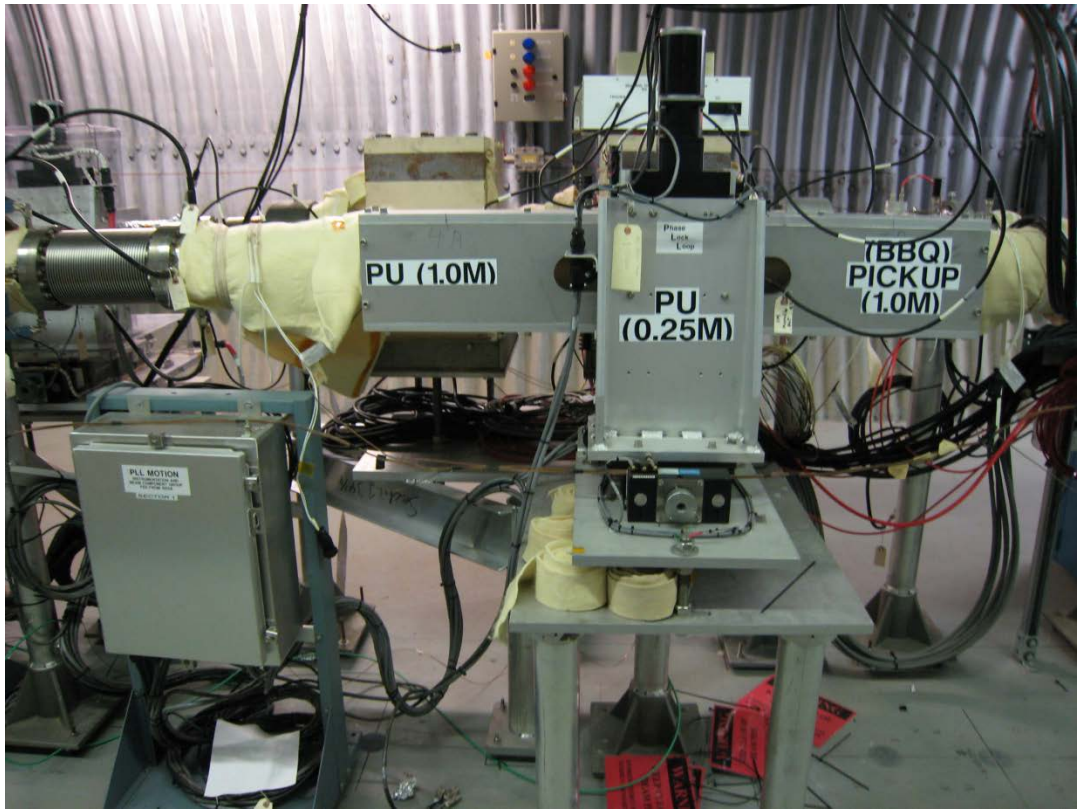
¼” heliax and motion control cables

Champions: Brown/Blaskiewicz

Triple Pick-up Assembly

Move from YO1 42m to YI2 59m

BBQ stripline pick-up (1m)
Quad pick-up (0.25m)
Head-Tail pick-up (1m)



¼” heliax and motion control cables

Champions: Minty/Marusic/Blaskiewicz

BBQ Kicker (1m strip line) & Quad Pick-Up (0.25m)

BBQ Move from YO1 40m to YI2 56m

Quad Pick-up moved adjacent to BBQ kicker to YI2 57m

Base-Band Tune Stripline Kicker

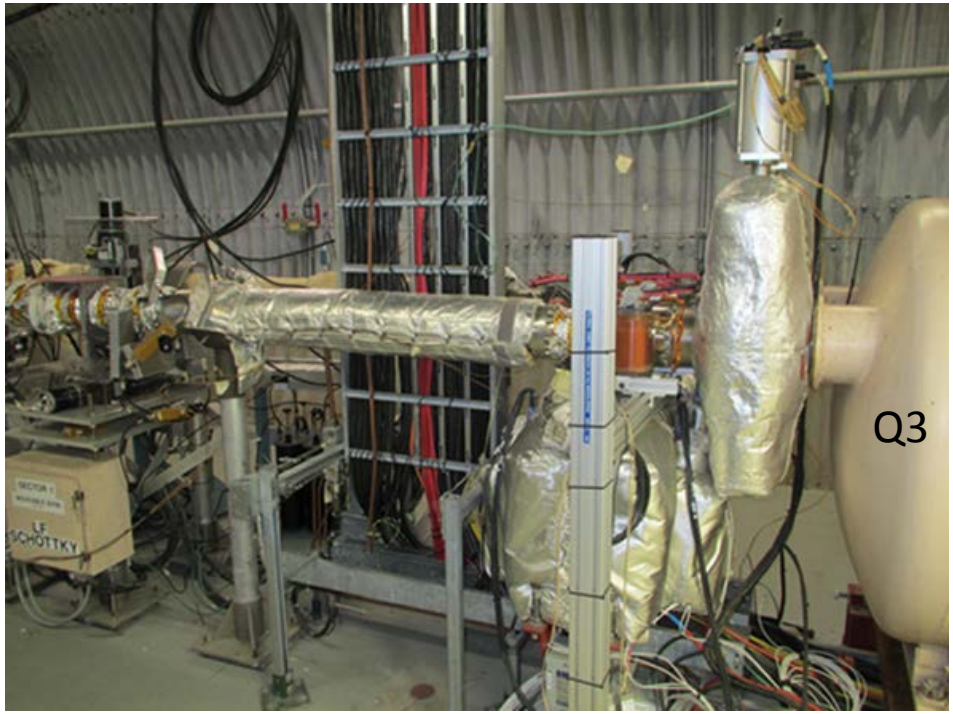
3/8” heliax cables

Champion: Mernick/Minty/Marusic

Cable Tray Waterfall (near Q3)

Cables will be rerouted in new tray
- Power supply
- Vacuum
- Instrumentation
- Cryo

Dave Phillips working on placing two trays: one against the triplet on the inside of the ring and one against the DX inside of the ring.



Next four slides are Excel versions of the Layouts

The s-parameters are approximate for general vicinity indications

- **Sector 1 Before Relocation**
- **Sector 1 After Relocation**

- **Sector 2 Before Relocation**
- **Sector 2 After Relocation**

Sector 1 Before Relocation

YO1 S	Meters from IP2	Yellow Outer (YO1) Label	Name	Notes	BI1 S	Meters from IP2	Blue Inner (BI1) Label	Name	Notes
2517.4	38.4		Start of warm sector	V-valve	2517.4		V-valve	Start of warm sector	near Q3
	38.7		10 Hz GOF Magnet					10 Hz GOF Magnet	
	39.6		EDV	Will be removed if it is still installed					
2515.9	39.8	KKR-1	Quad PU (0.25m, 10")	Relocated to YI2					
	40m		Start LEReC			40m		Start LEReC	
2515.2	40.1	KKR-2	BBQ (PLL) Kicker (1m, 39")	(twisted pr push-pull)	2515.1	40.9	MBPM	LF Schottky resonant PU (BPM)	All one moving assy
					2514.7	41.3	MBPM2	LF Schottky BPM for centering	53" length
2513.9	41.5	KKR-2	Head-Tail PU (1m)						
2513.3	42.4	KKR-1	Quad PU (0.25m, 10")	All one moving assy					
2512.6	42.7	KKR-2	BBQ (PLL) PU (1m)	115" length	2513.3	42.8	IPM H	B-Ionization PM Horiz (54")	Move to Sector 12
					2512.9	43.5	KKR-1	Hybrid Kicker (0.25m)	Not needed, will be removed
2510.7	46.1	TMKH	ARTUS Kicker Horizontal (start) 2m long		2510.5	45.5	Electron det. V	MCP & RHIC ED Vertical	Not Needed, will be removed
2508.7	48.1	TMKH	ARTUS Kicker Horizontal 2m long		2510.2	45.7	EDH-ANL	Electron Detector Horizontal	Not Needed, will be removed
	48.3	EDV	Electron detector V	Not needed					
			Pin diodes (4)						
	53.1	LM	Lumi-mon (only a cross)	Not needed	2503.6	53.2	GCK+TMKV	ARTUS Kicker V, 2m (or Bunch-by-Bunch longit damper?)	
								This device was removed for service as of 10-21-13	
2501.8	55	IPM-V	Y-Ionization PM Vert (58")	Move to Sector 12	2501.6	55.2	GCK+TMKV	ARTUS Kicker V, 2m (or Bunch-by-Bunch longit damper?)	
	63m		End LEReC U-Turn			63m		End LEReC U-Turn	
	64m		1 meter space needed?			64m		1 meter space needed?	
	~7 Meters of open space					~2 Meters of open space			
						66	R-SC Ceramic PU		To be removed
						68.6	R-SC PU	Existing	
						69	R-SC PU New desig	Future	
	71.5		Bellows & Vacuum pump						
2483.4	72.5		End of warm sector	V-valve	2483.4		V-valve	End of warm sector	near Q4

Sector 1 After Relocation

YO1	Meters	Yellow Outer (YO1)			BI1	Meters	Blue Inner (BI1)		
S	from IP2	Label	Name	Notes	S	from IP2	Label	Name	Notes
2517.4	38.4		V-valve go1-sv3	Start of warm sector	2517.4	38.4	V-valve, bi1-sv3	Start of warm sector	near Q3
	38.7		10 Hz GOF Magnet			38.7		10 Hz GOF Magnet	
2515.9					2515.9				
	40m		Start LEReC			40m		Start LEReC	
2491.9	63m		End LEReC U-Turn		2491.9	63m		End LEReC U-Turn	
2491.4			Vacuum Valve		2491.4			Vacuum Valve	
					2489	66	MBPM	LF Schottky resonant PU (BPM)	All one moving assy
					2488	67	MBPM2	LF Schottky BPM for centering	53" length
	~7 Meters of open space								
					2485.2	68.6	R-SC PU		Existing
						69	R-SC PU New desig	Future reserved space	
2484	71.5		Vacuum pump		2484	71.5		Vacuum pump	
2483.4	72.5		V-valve, go1-sv4	End of warm sector	2483.4	72.5	V-valve, bi1-sv4	End of warm sector	near Q4

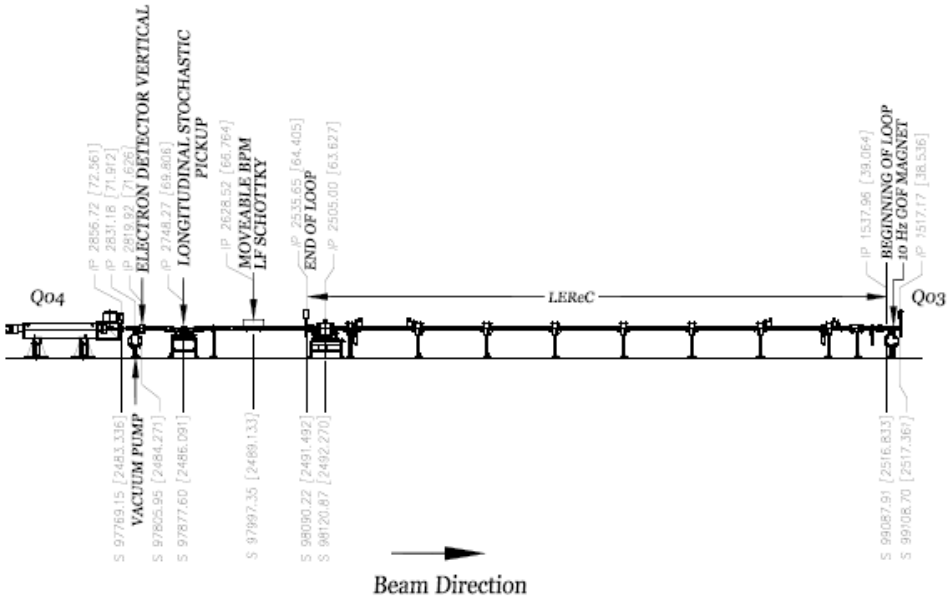
Sector 2 Before Relocation

YI2	Meters	Yellow Inner			BO2	Meters	Blue Outer		
S	from IP2	Label	Name	Notes	S	from IP2	Label	Name	Notes
2594.4	38.4		Start of warm sector		2594.4			Start of warm sector	near Q3
			10 Hz GOF Magnet					10 Hz GOF Magnet	
		MBPM	Moveable BPM			40.12	KKR-1	Quad Pick-up (0.25m)	
2596.5		MBPM2	Moveable BPM (LF Schottky)		2596.5	41.12	KKR-2	BBQ Kicker (1m)	
2598	41.5	IPM-H	Y-Ionization PM horizontal						
			Beam Loss Monitor		2598.5	42.9	KKR-2	PLL BBQ PU -Head-tail (1m) Moveable	
2599.3	42	KKR-2	Hybrid Kicker (0.25m)				KKR-1	Pick-up (0.25m) Moveable	
							KKR-2	Baseband PLL Kicker (1m) Moveable	
					2601	43.5	TMKH	ARTUS Kicker Horizontal (start)	
	~7 Meters of open space				2603	46.1	TMKH	ARTUS Kicker Horizontal (end)	
					2604.1	48.3	EDV	Electron Det V	To be removed
2605.1	47.8	EDV	Electron Det V	To be removed					
						~4 Meters open space			
2608	53	TMKV	ARTUS Kicker V(or Bunch-by-Bunch longit damper)		2608.8	53	LM & EDV	Lumi-Mon & EDV (6-way cross)	Will remove
2610	55	TMKV	ARTUS Kicker V(or Bunch-by-Bunch longit damper)		2610	55	IPM-V	B-Ionization PM Vertical	
2611	56		Vacuum pump	not moved	2611			Vacuum pump	
					2612	58	TWC	Traveling Wave Cavity	
	~5 Meters of open space					~7 Meters of open space			
2617.4	61.8	SC Long Pick-up (start)		To be removed					
	64	SC Long Pick-up (middle)		To be removed					
	66	SC Long Pick-up (end)		To be removed					
	67	Button BPM			2622	67	Button BPM		
2623	68	WCM			2623.5	68	WCM		
2614.3	68.6	DCCT			2624.3	68.6	DCCT		
	69	HF Schottky PU				69	HF Schottky PU		
		Pin diodes (2)							
	71	New Long SC pickup							
2628.4			V-valve, End of warm sector		2628.4			End of warm sector	near Q4

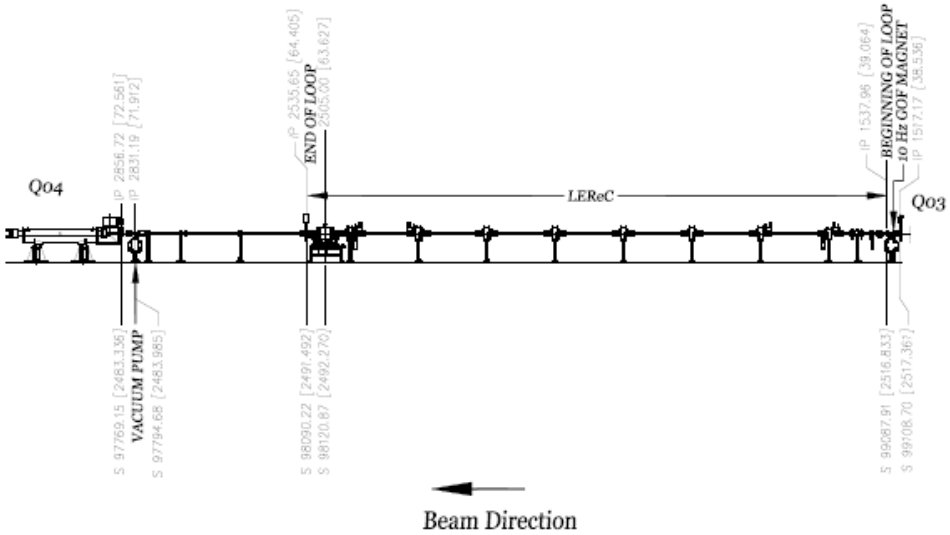
Sector 2 After Relocation

YI2	Meters	Yellow Inner			BO2	Meters	Blue Outer		
S	from IP2	Label	Name	Notes	S	from IP2	Label	Name	Notes
2594.4	38.4		v-valve, gi2-sv3	near Q3	2594.4	38.4		v-valve, bo2-sv3	near Q3
			10 Hz GOF Magnet	not moved				10 Hz GOF Magnet	not moved
		MBPM	Moveable BPM			40.12	KKR-1	Quad Pick-up (0.25m)	not moved
		MBPM2	Moveable BPM (LF Schottky)	not moved	2596.5	41.12	KKR-2	BBQ Kicker (1m)	not moved
2598	41.5	IPM-H	Y-Ionization PM horizontal	not moved	2598.5	42.9	KKR-2	PLL BBQ PU (1m) Moveable)	not moved
			Beam Loss Monitor	not moved			KKR-1	Pick-up (0.25m) Moveable	not moved
2599.3	42	KKR-2	Hybrid Kicker (0.25m)				KKR-2	Baseband PLL Kicker (1m) Move	not moved
	44	KKR-1	Quad PU (0.25m, 10")	From YO1	2601	43.5	TMKH	ARTUS Kicker Horizontal (start)	not moved
					2603	46.1	TMKH	ARTUS Kicker Horizontal (end)	not moved
		TMKH	ARTUS Kicker Horizontal (start) 2m long						
		TMKH	ARTUS Kicker Horizontal 2m long						
					2605	50	GCK+TMKV	ARTUS Kicker V, 2m (Bunch-by-Bunch longit damper)	
					2609	54	GCK+TMKV	ARTUS Kicker V, 2m (Bunch-by-Bunch longit damper)	
2608	53	TMKV	ARTUS Kicker V(or Bunch-by-Bunch	not moved					
2610	54	TMKV	ARTUS Kicker V(or Bunch-by-Bunch	not moved	2610	55	IPM-V	B-Ionization PM Vertical	not moved
2611	55		Vacuum pump	not moved	2611	56		Vacuum pump	not moved
	56	KKR-2	BBQ (PLL) Kicker (1m, 39") (twisted pr push-pull)		2612	58	TWC	Traveling Wave Cavity	not moved
	57		Quad PU (0.25m, 10")						
	58	KKR-2	Head-Tail PU (1m)			~7 Meters of open space			
	59	KKR-1	Quad PU (0.25m, 10")						
	60	KKR-2	BBQ (PLL) PU (1m)	115" length					
2622	67	Button BPM		not moved	2622	67	Button BPM		not moved
2623	68	WCM		not moved	2623.5	68	WCM		not moved
2624.3	68.6	DCCT		not moved	2624.3	68.6	DCCT		not moved
2624.8	69	HF Schottky PU		not moved	2624.8	69	HF Schottky PU		not moved
		Pin diodes (2)		not moved					
	71	New Long SC pickup		not moved					
			Vacuum Pump	not moved				Vacuum Pump	not moved
2628.4			V-valve, gi2-sv4	near Q4	2628.4			V=valve, bo2-sv4	near Q4

Sector 1

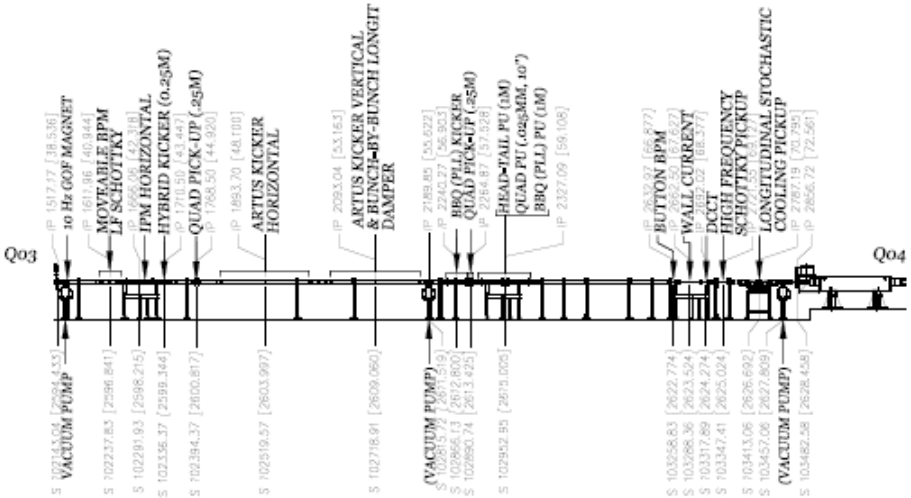


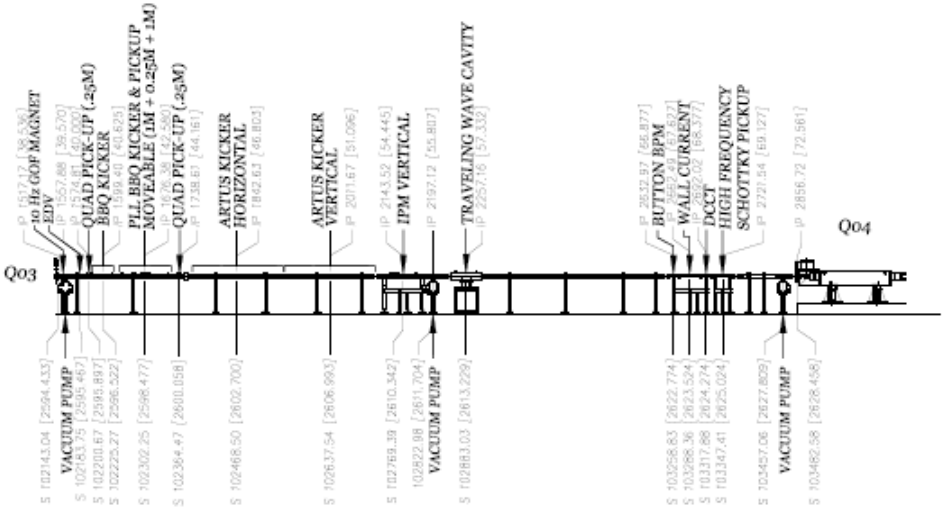
BLUE INNER SECTOR 01
VIEW LOOKING OUT FROM RING CENTER



YELLOW OUTER SECTOR 01
VIEW LOOKING OUT FROM RING CENTER

Sector 2


Q03
Q04
10 Hz GOF MAGNET
MOVEABLE BPM
LF SCHOTTKY
IPM HORIZONTAL
HYBRID KICKER (0.25M)
QUAD PICK-UP (.25M)
ARTUS KICKER
HORIZONTAL
ARTUS KICKER VERTICAL
& BUNCH-BY-BUNCH LONGIT
DAMPER
BBQ (PLL) KICKER
QUAD PICK-UP (.25M)
HEAD-TAIL PU (1M)
QUAD PU (.025MM, 10°)
BBQ (PLL) PU (1M)
BUTTON BPM
WALL CURRENT
DCCT
HIGH FREQUENCY
SCHOTTKY PICKUP
LONGITUDINAL STOCHASTIC
COOLING PICKUP
VACUUM PUMP
(VACUUM PUMP)
Beam Direction
YELLOW INNER SECTOR 2
VIEW LOOKING OUT FROM RING CENTER


Q03
Q04
10 Hz GOF MAGNET
EDV
QUAD PICK-UP (.25M)
BBQ KICKER
PLL BBQ KICKER & PICKUP
MOVEABLE (1M + 0.25M + 1M)
QUAD PICK-UP (.25M)
ARTUS KICKER
HORIZONTAL
ARTUS KICKER
VERTICAL
IPM VERTICAL
TRAVELING WAVE CAVITY
BUTTON BPM
WALL CURRENT
DCCT
HIGH FREQUENCY
SCHOTTKY PICKUP
VACUUM PUMP
Beam Direction
BLUE OUTER SECTOR 2
VIEW LOOKING OUT FROM RING CENTER