

Empirical Steering in Jefferson Lab's Injector

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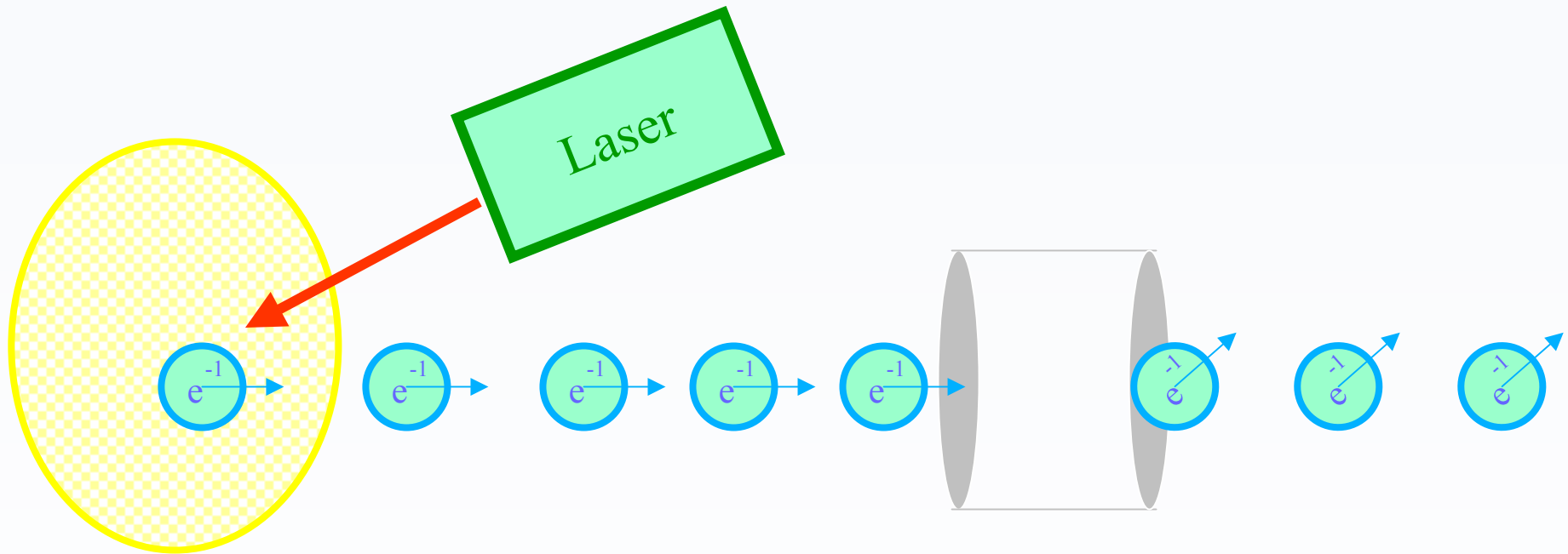


November 19-22

EPICS Collaboration

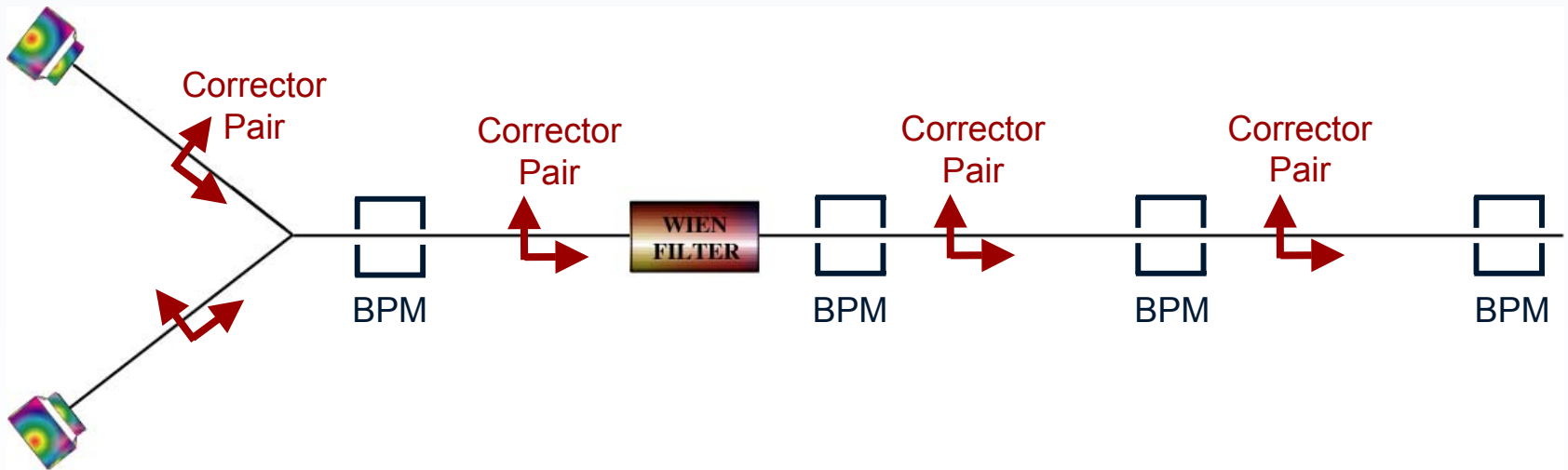
Controls Group

100keV Injector Region

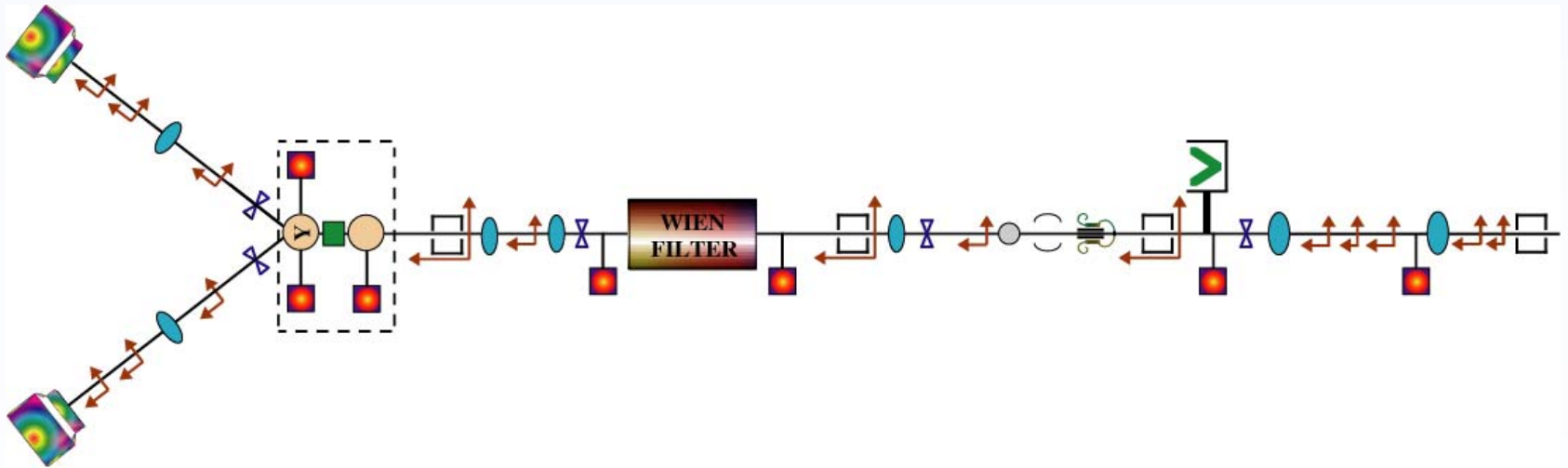


Not To Scale!!

Previous Solutions



Model Based Steering



$$\begin{bmatrix} E1 \end{bmatrix} \times \begin{bmatrix} E2 \end{bmatrix} \times \begin{bmatrix} E3 \end{bmatrix} \times \dots \times \begin{bmatrix} En \end{bmatrix} \times \begin{bmatrix} Corr1 \end{bmatrix} = \begin{bmatrix} BPM1 \end{bmatrix}$$

Empirical Steering

$$\begin{array}{|c|} \hline \text{Calibration} \\ \hline \text{Matrix} \\ \hline \end{array}^{-1} \times \begin{bmatrix} \text{BPM1} \\ \text{Corr1} \\ \text{BPM2} \\ \text{Corr2} \\ \text{BPM3} \\ \text{Corr3} \\ \vdots \\ \text{BPM10} \\ \text{Corr10} \end{bmatrix} = \begin{bmatrix} \text{BPM1} \\ \text{Corr1} \\ \text{BPM2} \\ \text{Corr2} \\ \text{BPM3} \\ \text{Corr3} \\ \vdots \\ \text{BPM10} \\ \text{Corr10} \end{bmatrix}$$

Results

- **< 3 Seconds to converge**
- **Ability to thread through region**
- **Calibration rarely necessary.**

Injector Steering Script

Injector Steering Script Version 1-1

Spin Change Spot Move Injector 0L Steering Expert Options

Wien Dipole Parameters

	Spin	Wien (BDL)	Wien HV	HV pol	
Original	-27.199	-639.5	18.047	Negative	Save Setup
Current	-27.199	-639.5	18.047	Negative	Restore Setup
Desired	-27.199	-639.5	18.047	Negative	

Set Wien Spin Change Steer Abort

Last Spin Matrix Initialization: 10/17/02 Gun: 2 Spin: -9 Spot: (1350,1300)

Medm Screens Help ZeroPos Injector

Gun 2I 3I Steer to Rels Golds Golds last updated: 09/04/02 by: carlino

Injector Currents

A1	A2	MS	FC1	A3	A4	0R07 BCM
0.3663	3.1063	6.3007	0.075458	0.050305	0.012576	14.347
0.3956	3.1944	6.1121	0.075458	0.050305	0.012576	13.614

Grab Intercepts

Ready

Detailed Status (Most recent at top)

09:22:32 : All injector SOFS match STANDARD.sof.snap
09:22:27 : Initial Magnet/HV/locse11 Gain Values Saved
09:22:21 : Connection complete
09:22:20 : ItoV not selected
09:22:19 : Connecting to All Signals

Quit

Other Successes

- **Free Electron Laser automated procedures**
- **Prototype for Empirical Locks**
- **Expanded to steer through rest of injector.**



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