Online Lattice Models And Beam Measurements

Models With Known Errors
PEPOPTICS Computer
Orbit Related Optical Effects
Beta Measurements

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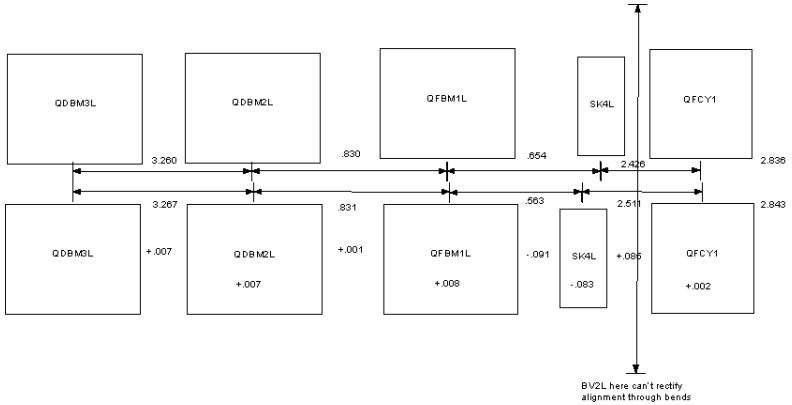
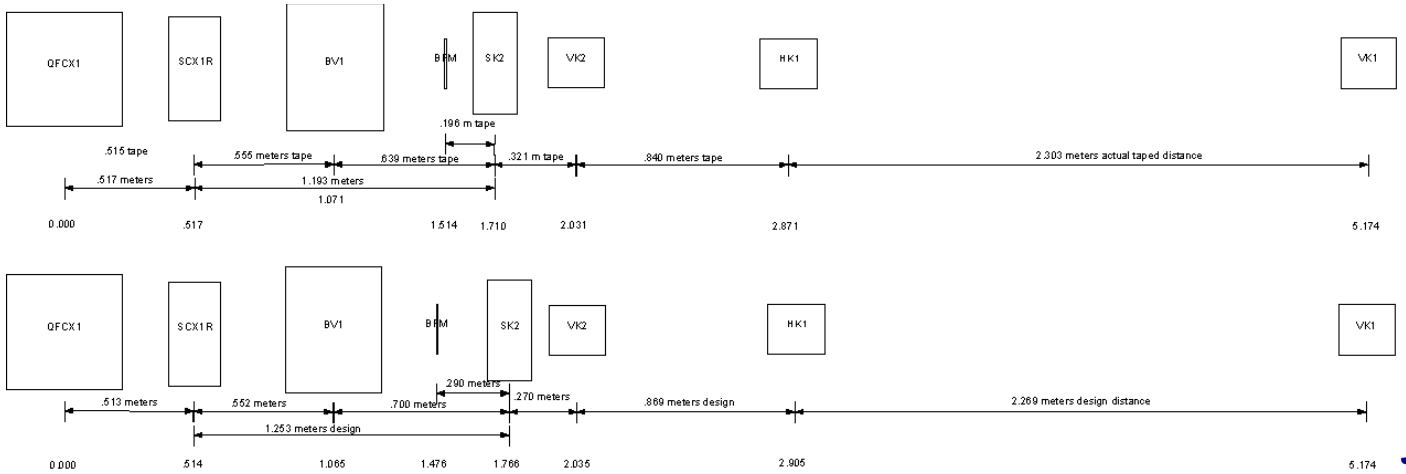
10/10/03

Alignment and Decks

- Z location errors
- Physicists with tape measures and SLAC Alignment Group. Agreement!
- LER deck done.
- HER in progress.





QD1 etc.

- Lab measurements by S. Ecklund and M. Sullivan predict field in permanent magnets immersed in the BABAR Solenoid field to be reduced. For QD1 the immersion is different side to side.
- Modeling by U. Wienands last summer showed the error predicted is very close to fitted beam data.
- That is now included in the model thanks to Martin Donald.

PEPOPTICS

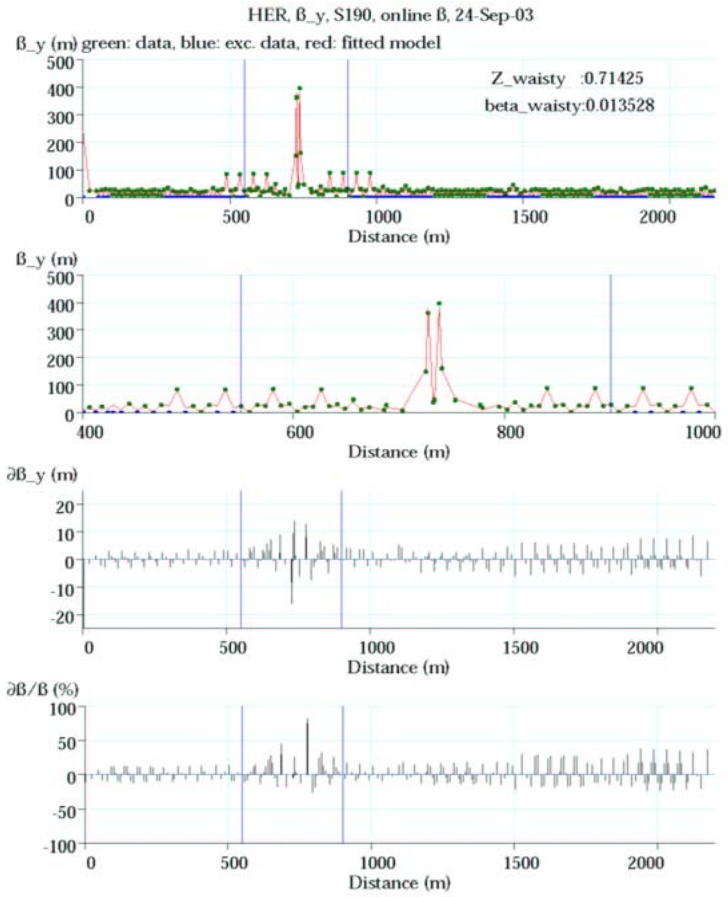
- Establishing a link between modeling codes and the accelerator control system.
- Linux box with MAD, MATLAB®, MIA, LEGO,…
- Firewalls, protocols, file transfers, scripts to run programs, experts, meetings.
- Push a button on the SLAC Control Program (SCP), data gets taken, files manipulated and transferred, programs run on PEPOPTICS and produce other files which are manipulated and transferred back. Operators implement the new changes with the SLAC Control Program.

Orbits

- Orbits in LER with strong sextupoles are a large component of the deviation of measured to design optics.
- Orbit effect in LER modeled successfully offline by U. Wienands last summer.
- New code on PEPOPTICS by M. Woodley includes orbit effect in LER and can put it into the SLAC Control Program for use in diagnosing problems, making bumps, and generally understanding what we're doing.

Using The New Online Model

- HER Beta functions are shown, where top is the full ring.
- Second is blow-up of IP area.
- Bottom are differences in fitted to modeled.



IP Beta* Measurements

- Beta by perturbed orbits: Betatron mode is excited by the tune measurement system to get a 1 mm orbit distortion. 1024 consecutive turn orbits are then collected and analyzed in a Matlab script file driven MIA (model independent analysis) method developed by Yiton Yan.
- With similar data, a “phase advance” analysis method employed by Wienands and Donald is to fit and compare the beta amplitude and phase to the model. The general rings are done online, but IP is done offline.

Beta Measurements contd.

- Beta by Quadrupole and Tune: The variant in PEPII is that the standard formula doesn't work in highly coupled areas and instead comparison is done to simulation, and IP Betas are estimated from that. This is manual acquisition and offline fitting.
- Other measurements: "Orbit Response Matrix" method (by J. Safranek et. al.) and a LEGO based coupling and dispersion analysis method (Y. Cai) are in development.

Beta Measurements (MIA)

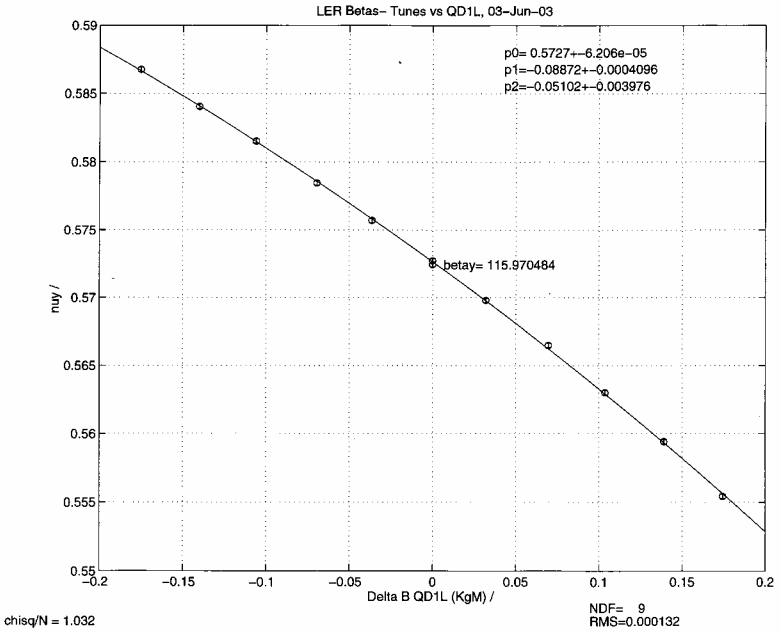
- MIA Results Table:

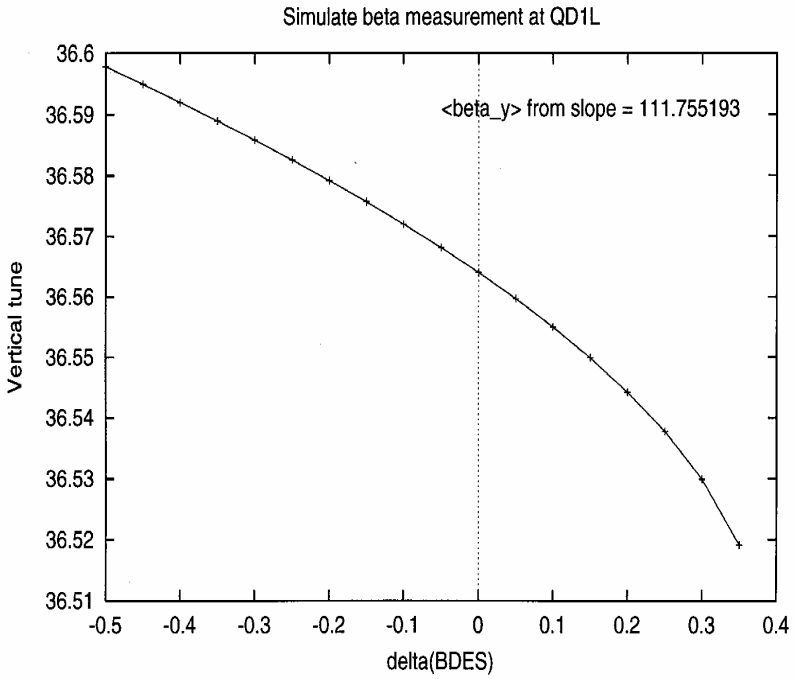
Date	HER		LER	
	Bx*	By*	Bx*	By*
2003 9 18	21	12.6	38	13.1
2003 9 12	27	11.6		
2003 6 19	24.1	12.7	52.3	12.5
2003 6 10	27.7	12.6	50.9	12.1
2003 6 3(5)	?	?	29.7*	14.2*
2003 6 3(4)	36.3*	17.3*		
2003 6 3(0)	50.2	14.0	27.7	14.1
2003 5 28	31.2	13.7*		
2003 4 29	42.9	11.2	37.2	11.9
2003 4 30	35.0	11.2		
2003 4 23			34.9	12.2
2003 4 8			39.0	12.6
2003 2 26			35.7	12.0

Beta Measurements (QD1)

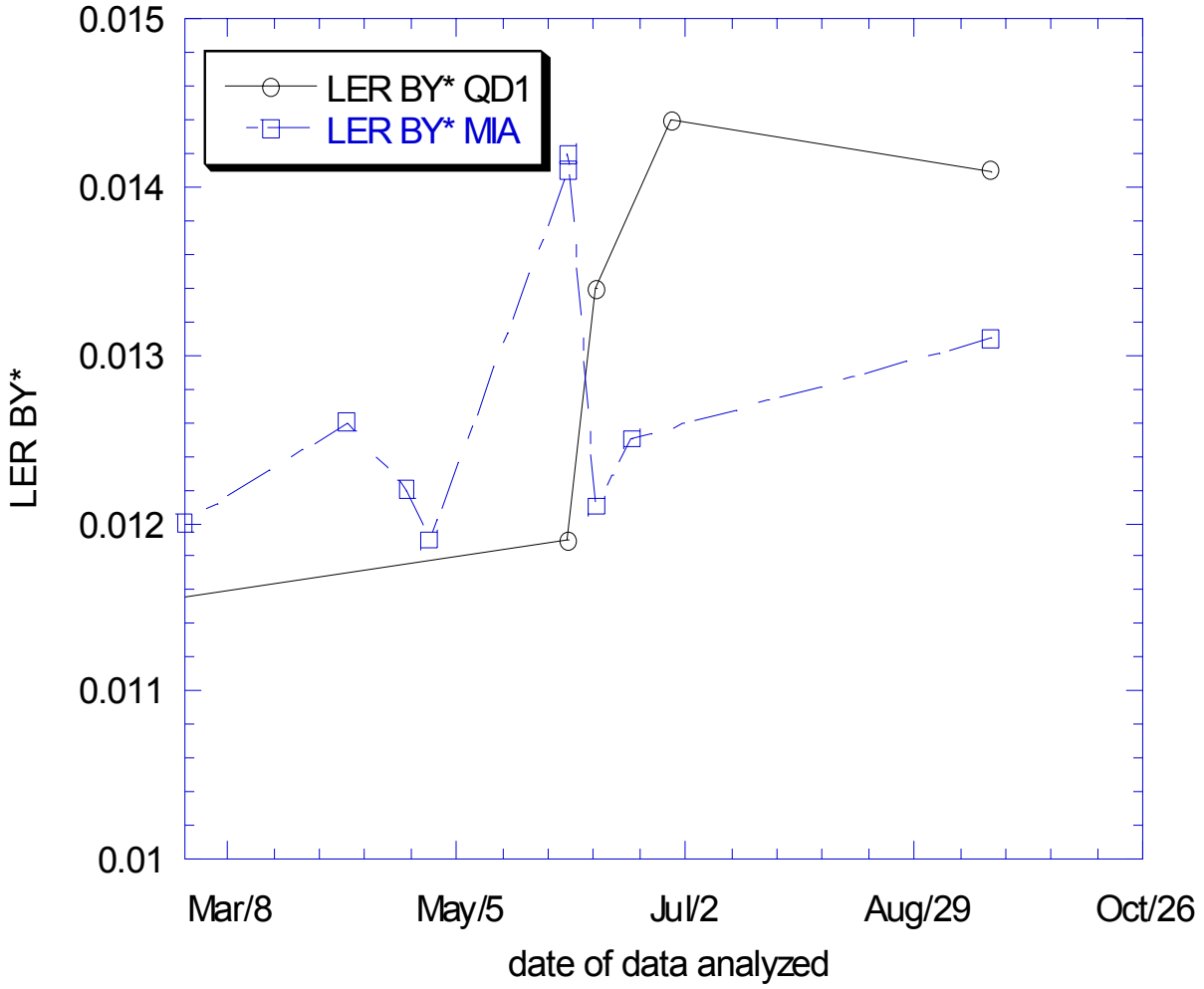
	LERBY*	HERBY*	LERBX*	HERBX*
9-Apr-2002	0.0104	0.0122	0.49	
3-Jun-2003	0.0119	0.0143	0.39	0.49
10-Jun-2003	0.0134	0.0123	0.65	0.39
29-Jun-2003	0.0144	0.0136	1.15	0.40
18-Sep-2003	0.0141	0.0127	0.45	0.41

Beta* from QD1





LER BY* QD1 and MIA



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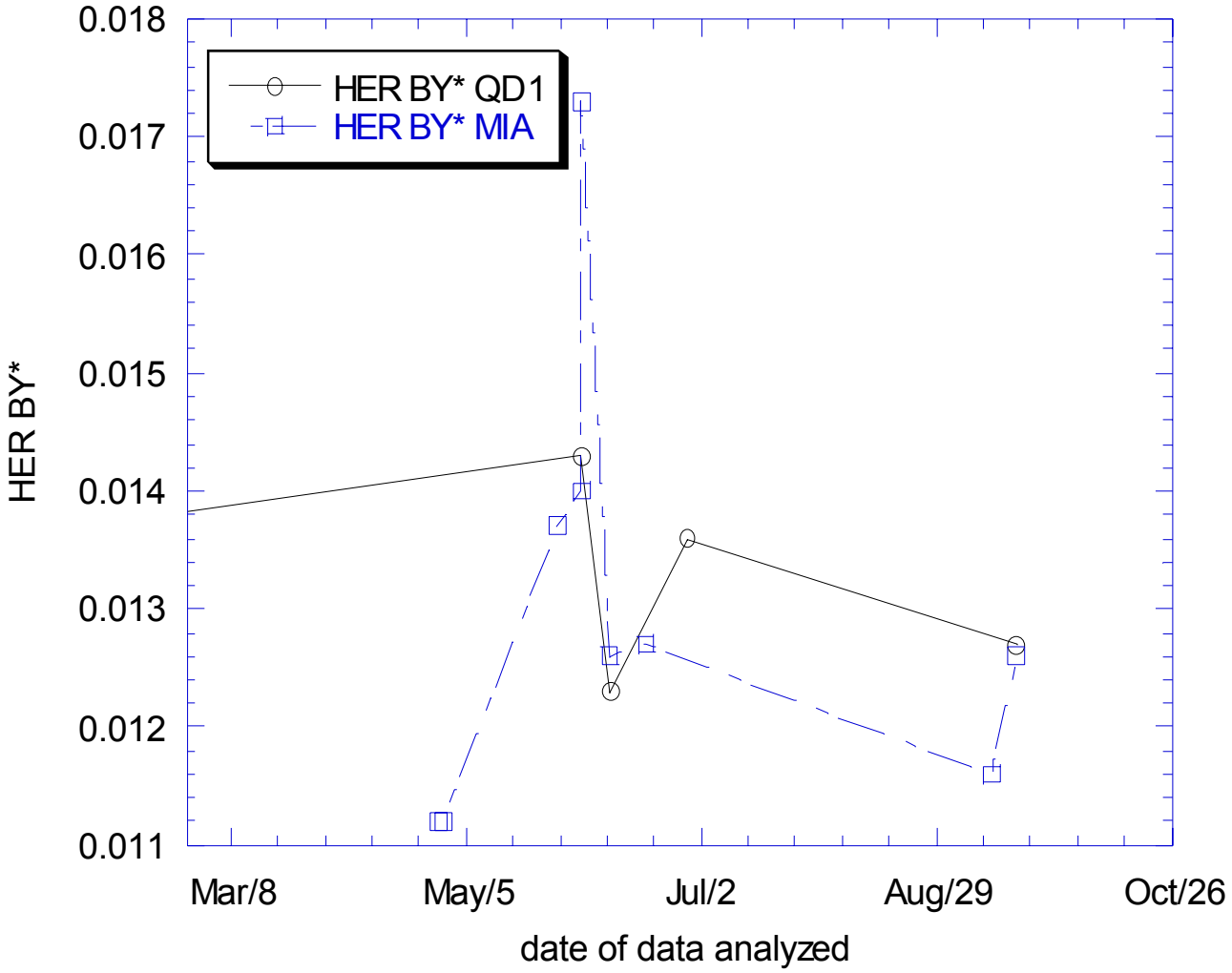
HER BY* QD1 and MIA



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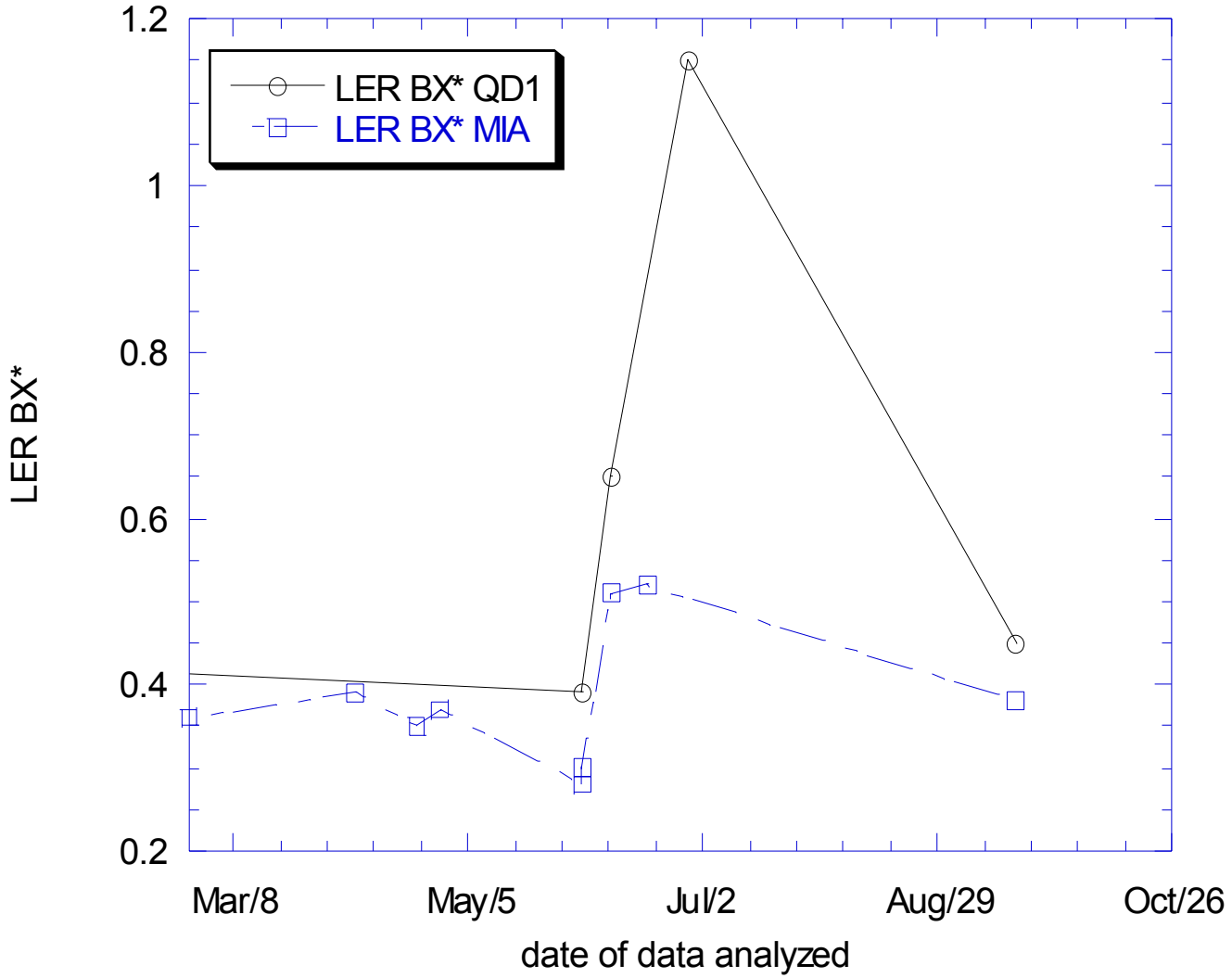
LER BX* QD1 and MIA



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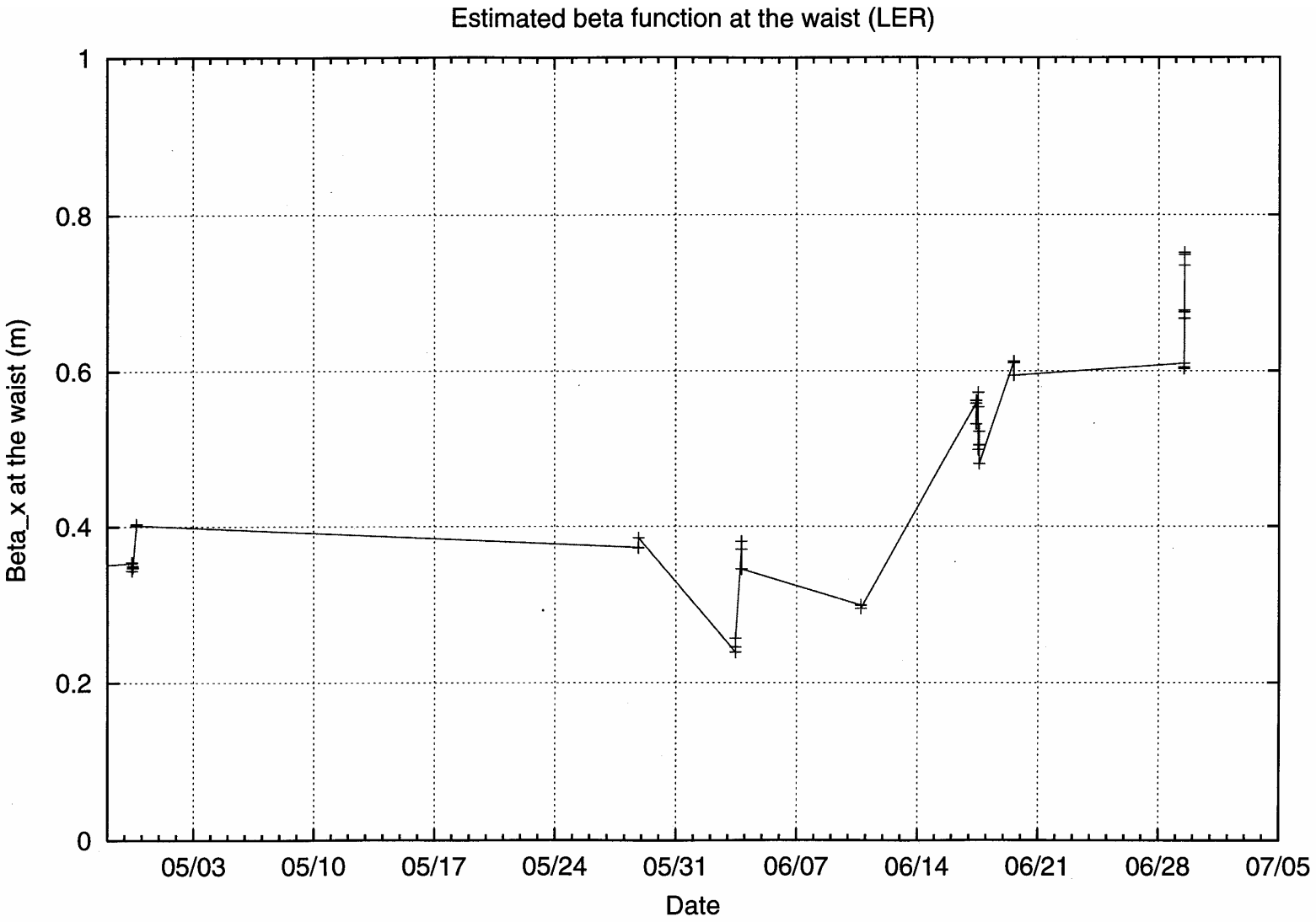
LER BX* from Phase Advance



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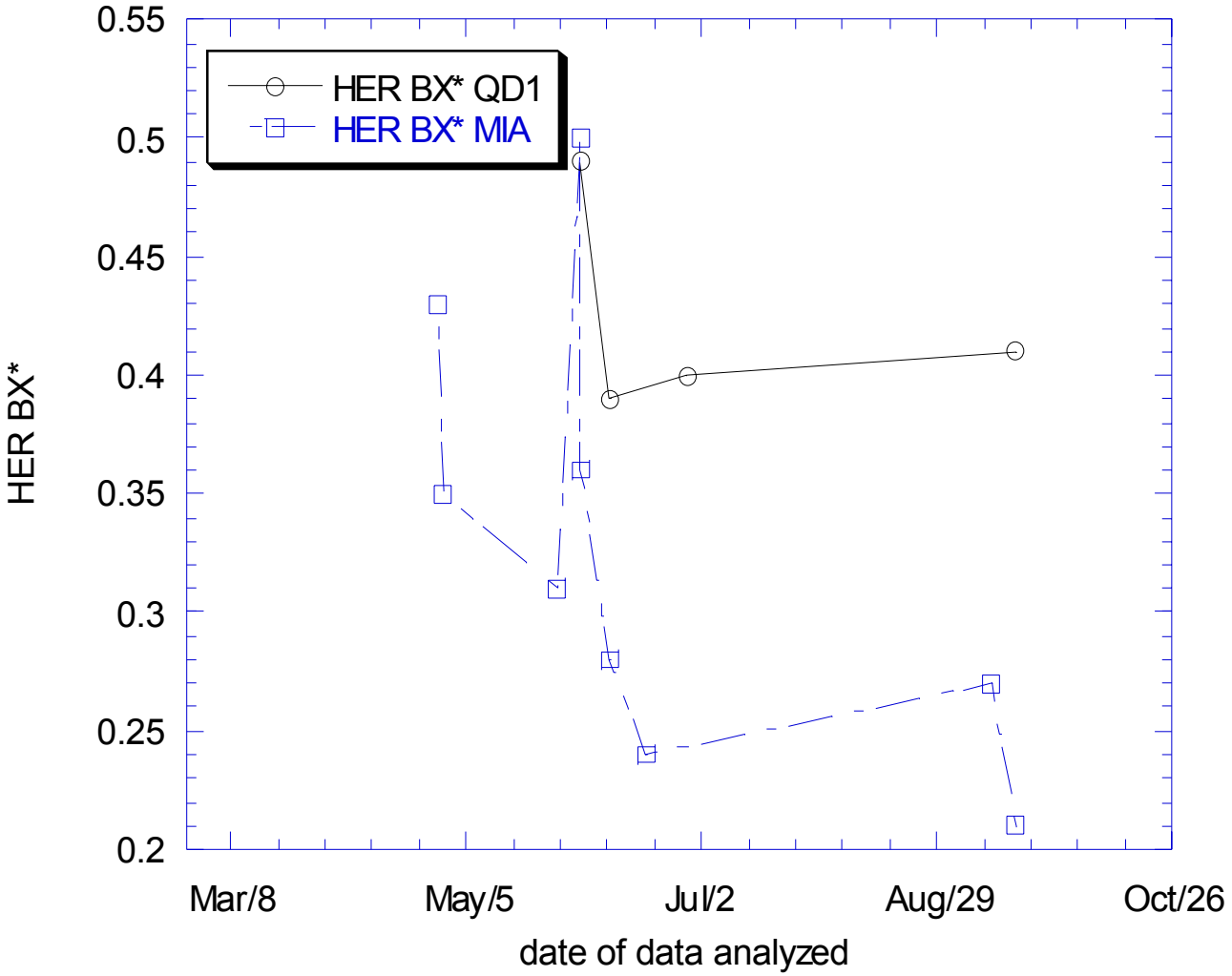
HER BX* QD1 and MIA



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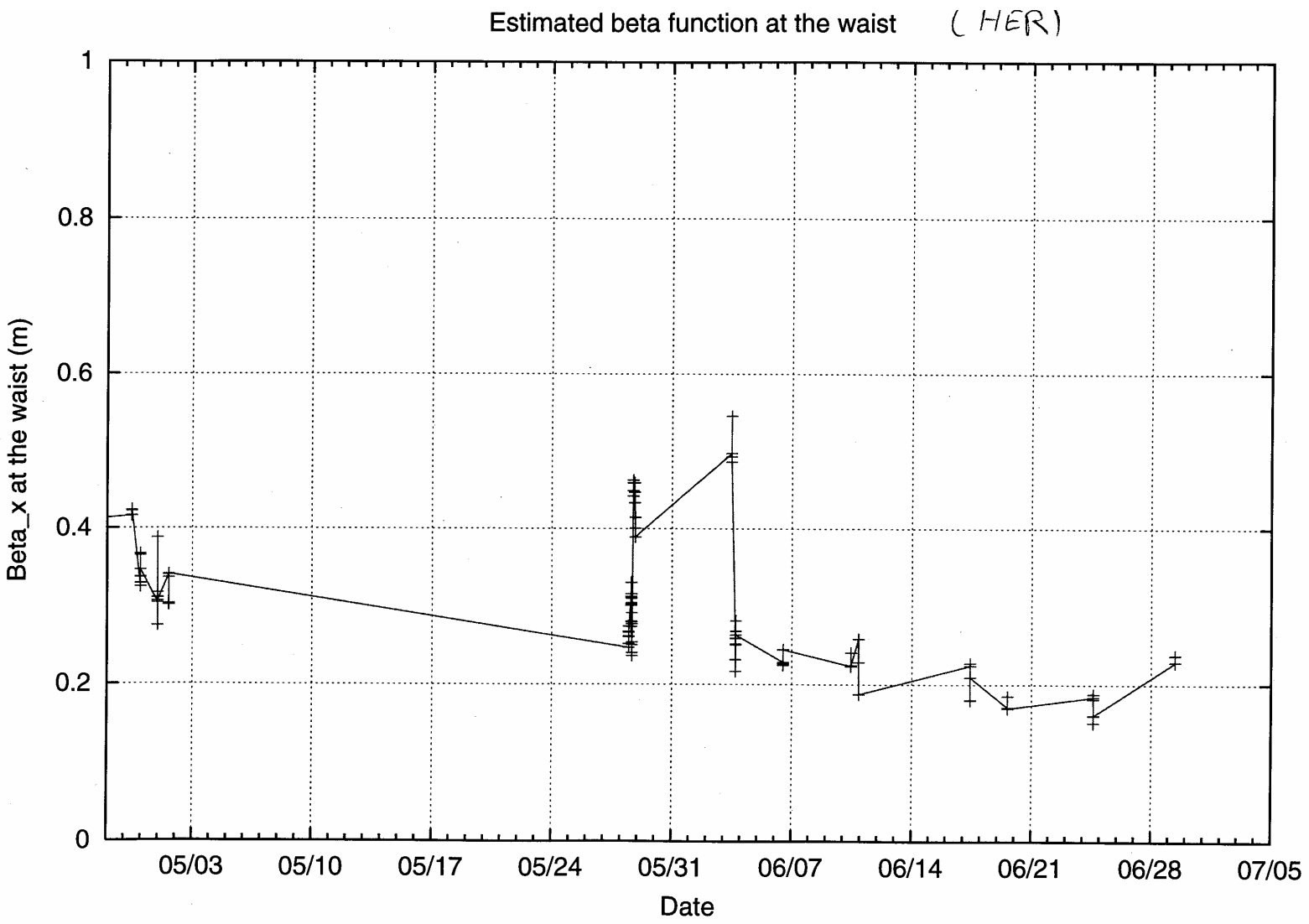
HER BX* from Phase Advance



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