

APEX EXPERIMENT s^* KNOB

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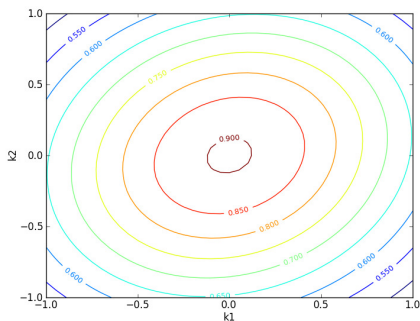
April 25, 2014

MOTIVATION

Luminosity reduction due to hourglass effect and s^*

$$\sigma_z = k_z \beta^*, s_1^* = k_1 \beta^*, s_2^* = k_2 \beta^*,$$

$$L = L_0 \int_{-\infty}^{\infty} \frac{2}{\sqrt{\pi}} \frac{\exp(-t^2) dt}{2 + (k_z t - k_1)^2 + (k_z t - k_2)^2},$$



Matching using quad knobs in insertion region

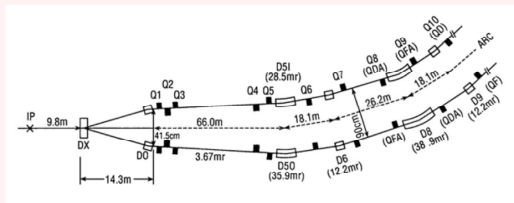
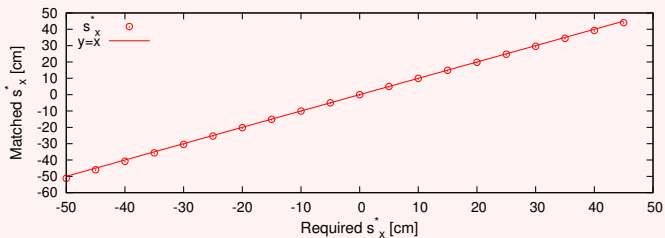
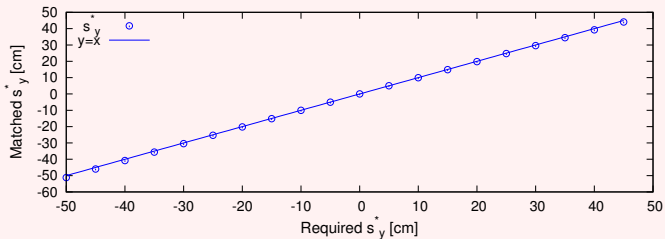
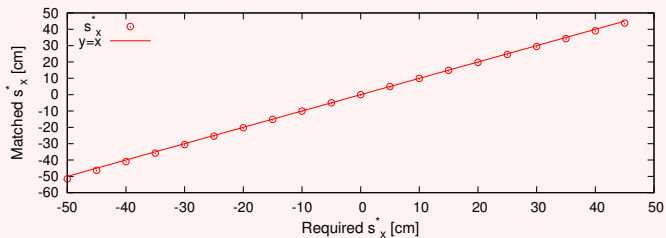
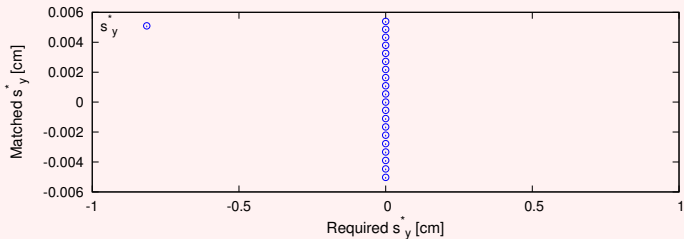
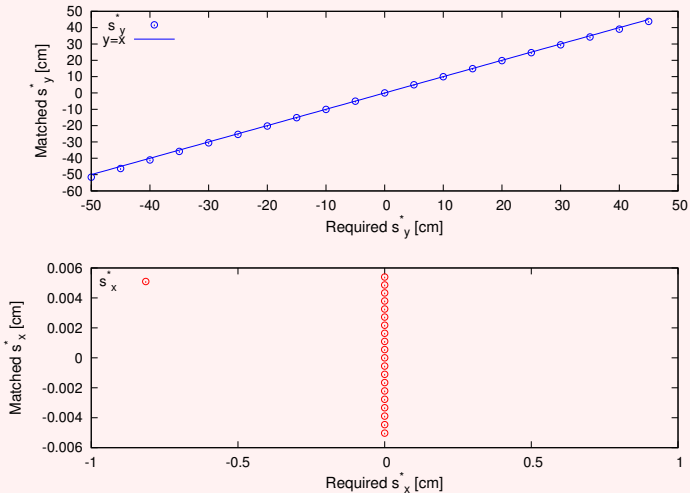


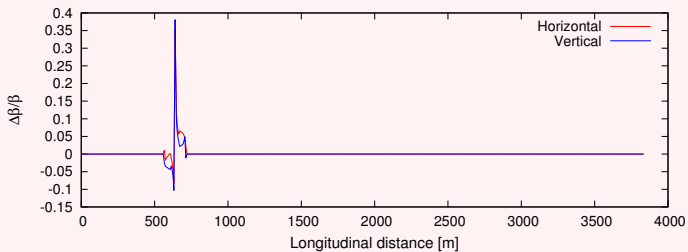
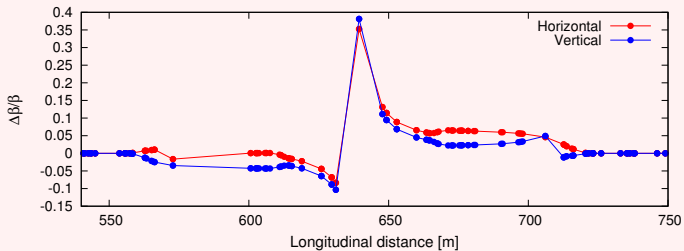
Figure 1 : One half of insertion region (IR).

Required v.s. matched s^* (Courtesy M. Bai).

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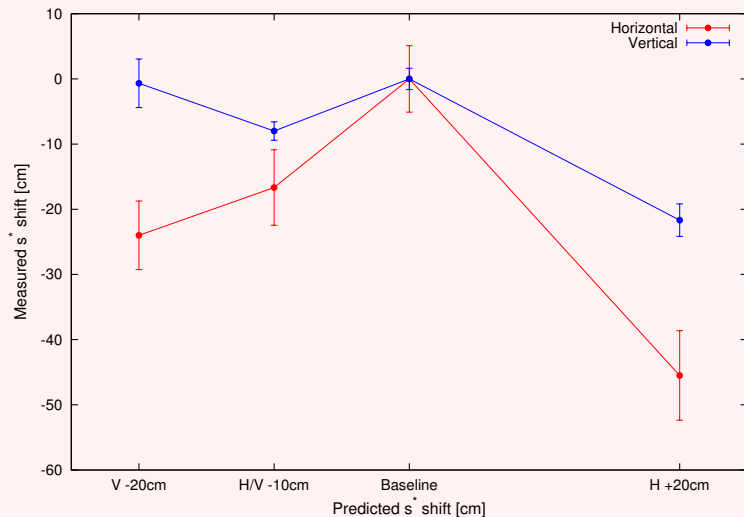
Required v.s. matched s^* (Courtesy M. Bai).

Beta-beat after mathcing (Courtesy M. Bai).



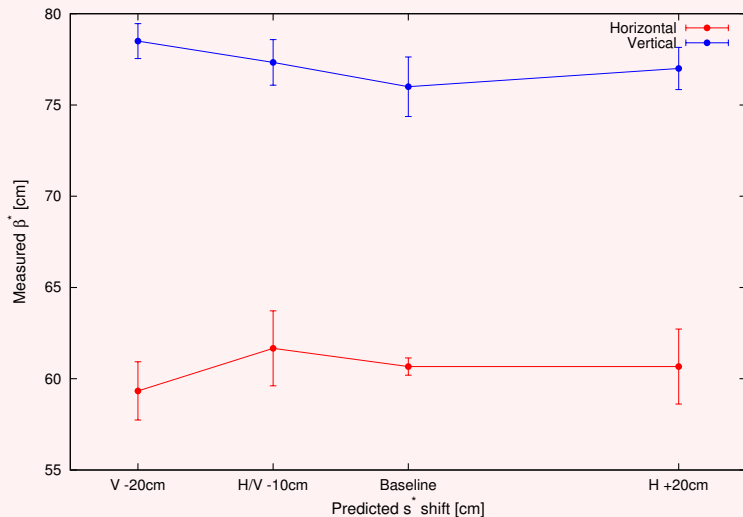
EXPERIMENTAL RESULTS

Predicted s^* shift v.s. measured s^* shift. Error bars reflect standard deviation.



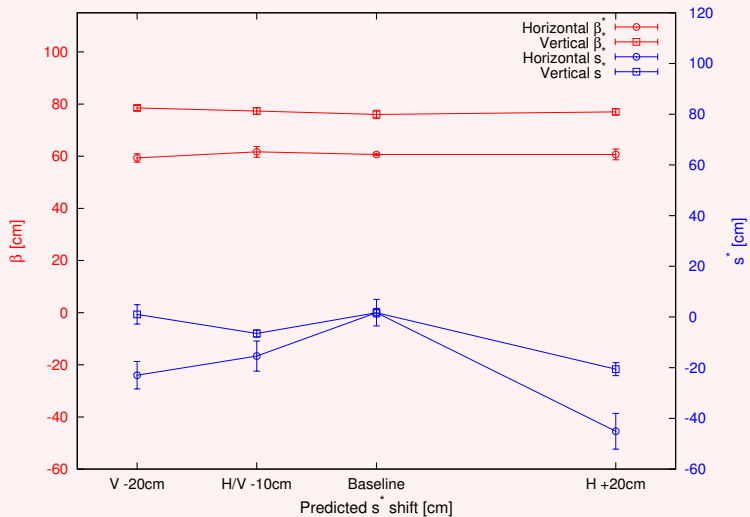
EXPERIMENTAL RESULTS

Predicted s^* shift v.s. measured β^* . Error bars reflect standard deviation.



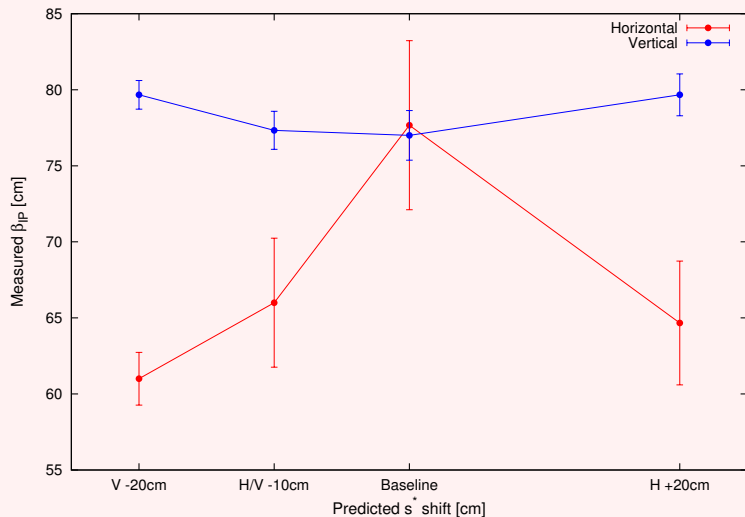
EXPERIMENTAL RESULTS

s^* and β^* . Error bars reflect standard deviation.



EXPERIMENTAL RESULTS

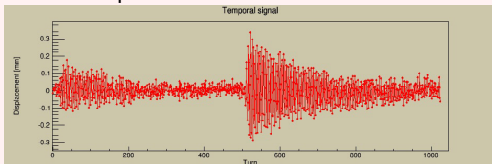
Predicted s^* shift v.s. measured β_{IP} . Error bars reflect standard deviation.



CONCLUSION

Turn-by-turn BPM based s^* measurement

- More sensitive than β^* measurement, strong coupling in the horizontal plane could be an issue



- s^* knob manipulation exhibits linear/nonlinear response range
- Manipulation with $\sim 20\%$ beta-beat, studies are in progress

Further study

- Improve machine condition for “cleaner” s^* manipulation and measurement
- Explore other methods