Impedance Localization: HT Studies

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Ack: R. Tomás

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Intensity Dependent Optics

Based on EPAC04 Paper: G. Arduini, F. Zimmermann, C.Carli

$$K_{eff} = \frac{eN_b}{2\sqrt{\pi}\sigma_z(E_b/e)} Im\{Z_{\perp,eff}\}$$

To 1^{st} order,ΔK perturbation with intensity causes:

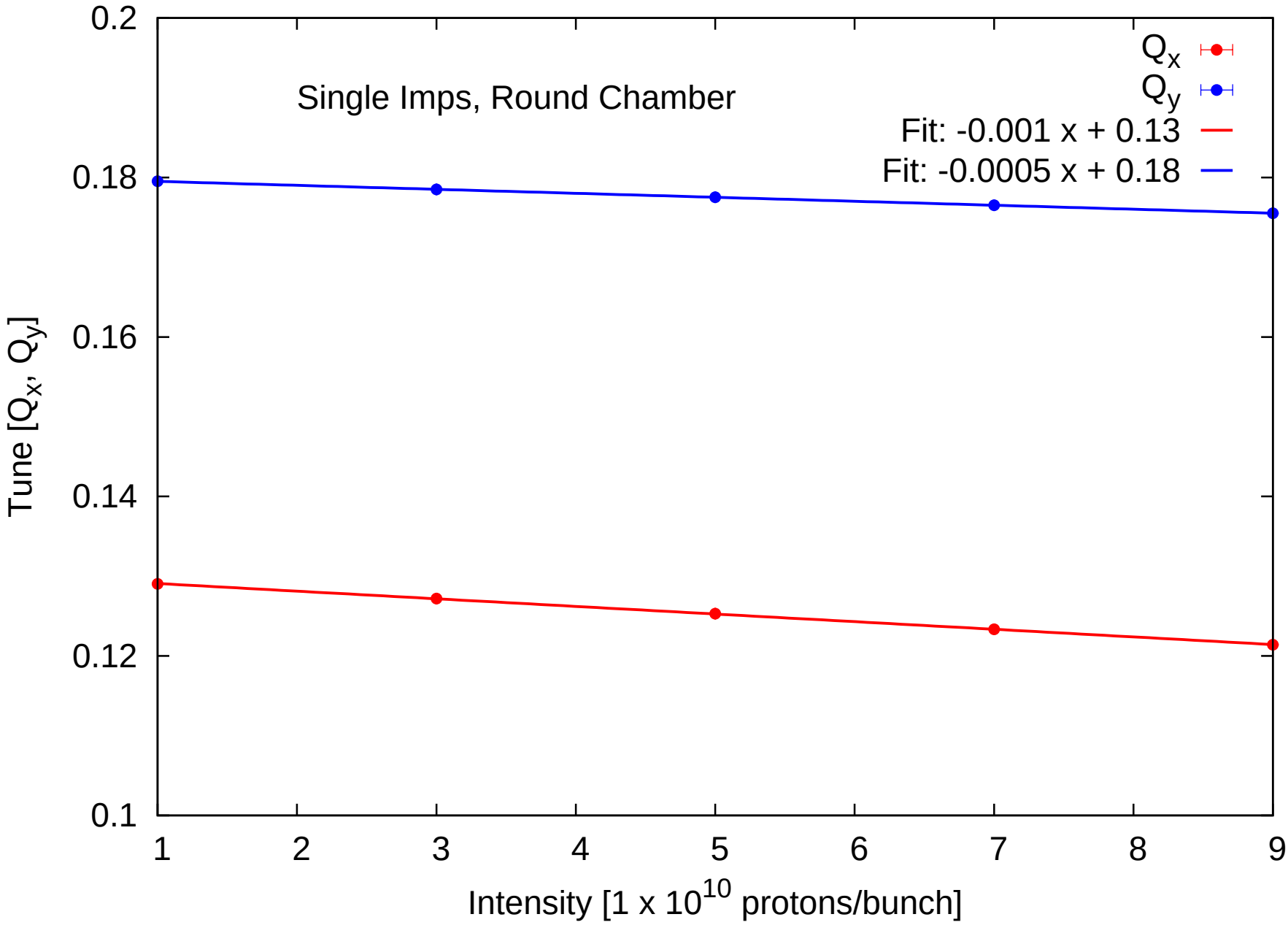
$$\Delta Q = \frac{1}{4\pi}\beta_k \Delta K$$

$$\frac{\Delta\beta(s)}{\beta(s)} = \frac{\beta_k \cos\left(2|\phi(s) - \phi_k| - 2\pi Q\right)}{2\sin\left(2\pi Q\right)}\Delta K$$

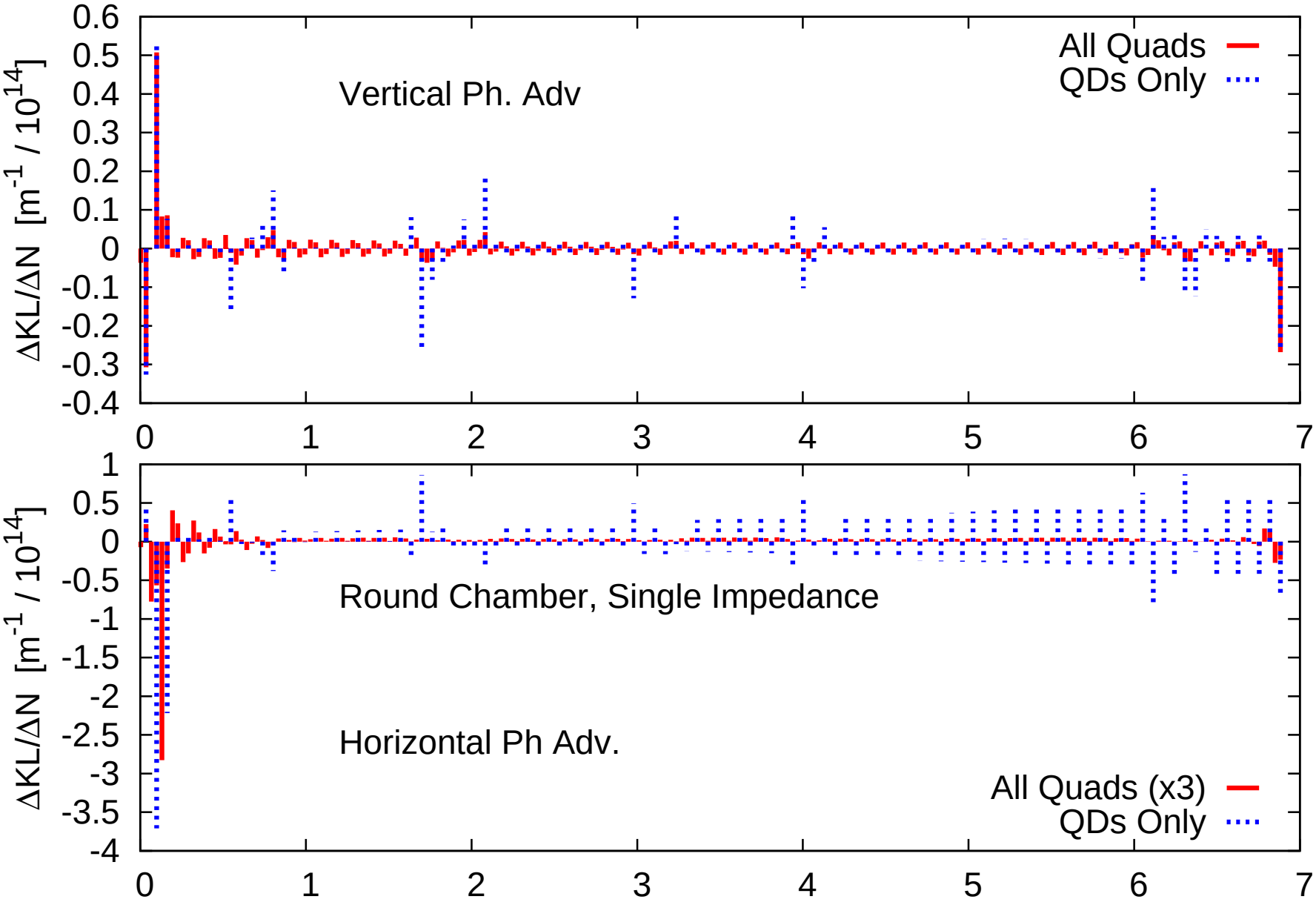
Procedure:

- Measure/Simulate phase advance between BPM pairs for varying intensities
- Linear fit: $\phi_I = \phi_0 + (\Delta\phi/\Delta N)N_b$
- $\Delta K = R^{-1}\{\Delta\phi/\Delta N_b, Q_x, Q_y\}$, where R is model response matrix

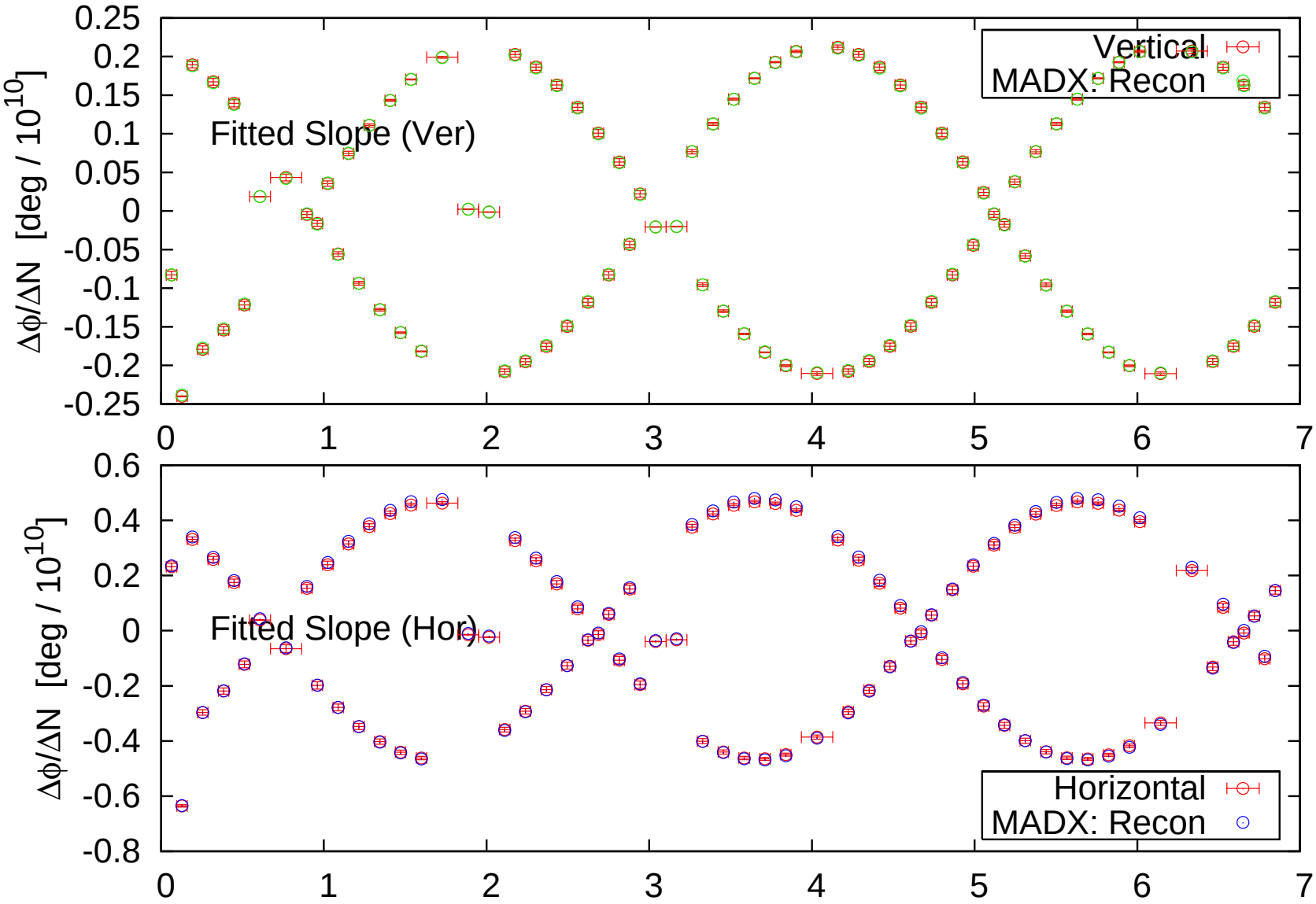
Case I: Intensity dependent ΔQ, Single Imp



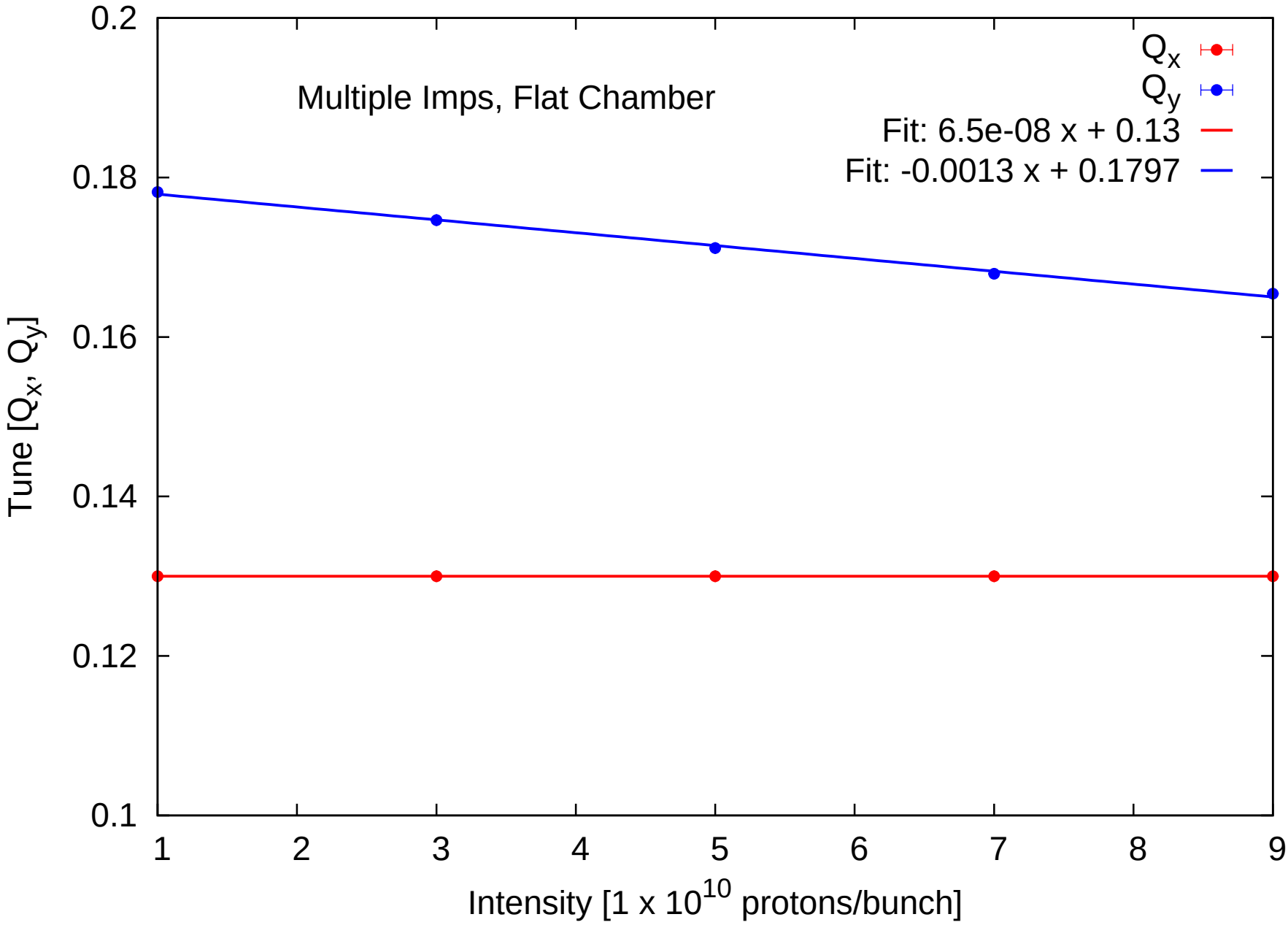
Recon ΔK_i, Single Imp



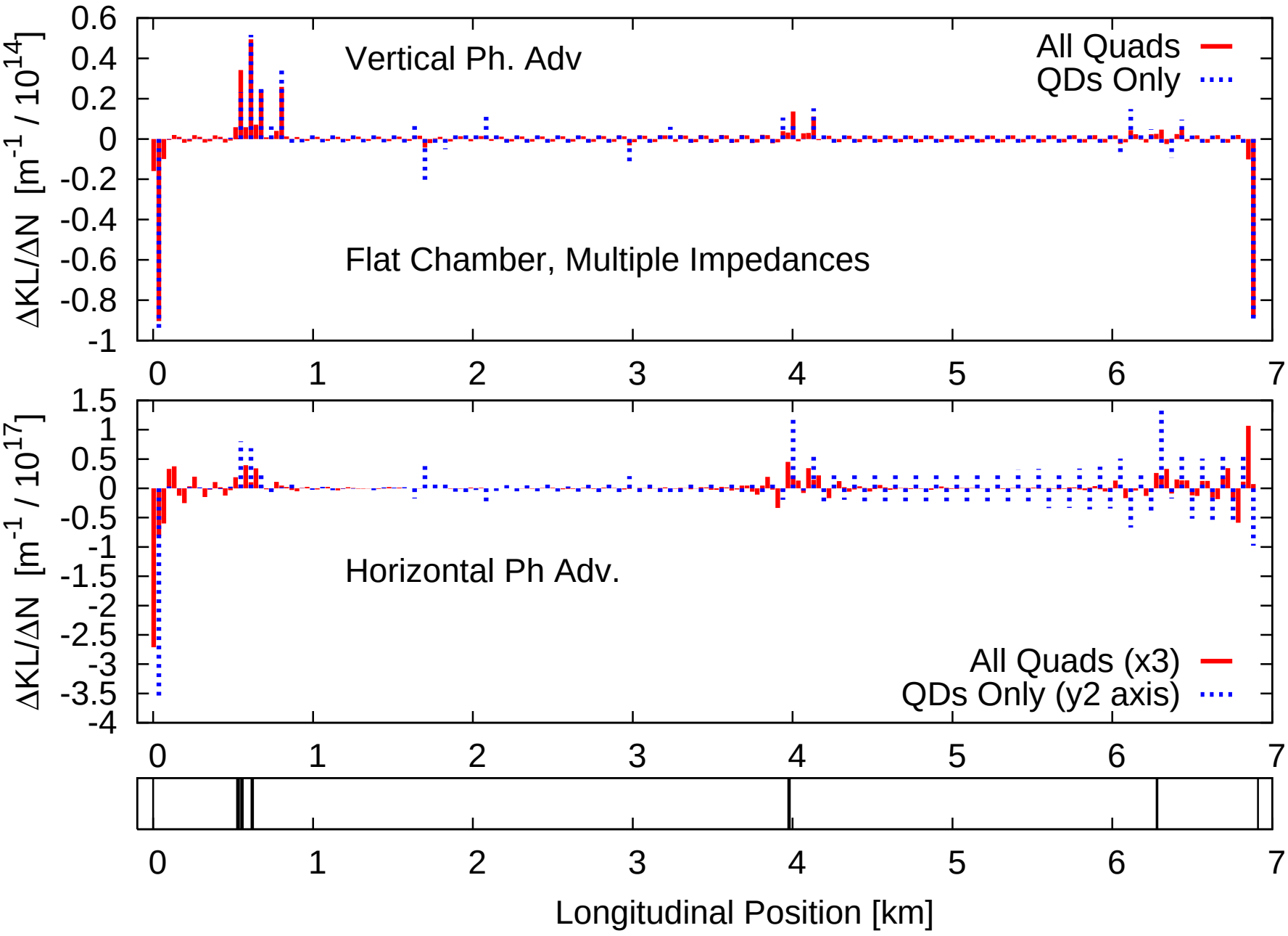
Intensity Fitted Slope $\{\Delta\phi_{a\rightarrow b}\}$



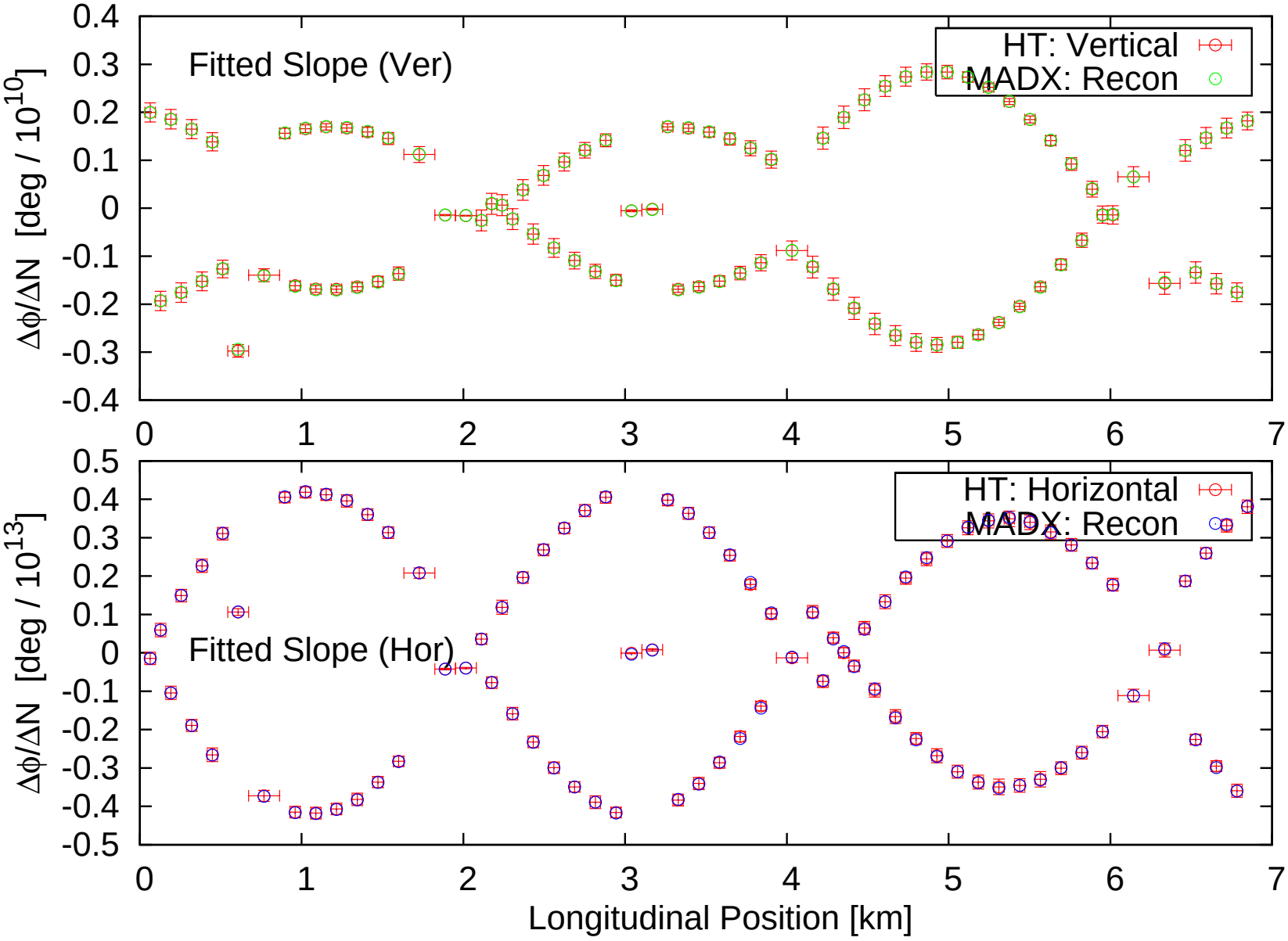
Case II: Intensity Vs. ΔQ, Multiple Imps



Recon ΔK_i Sources

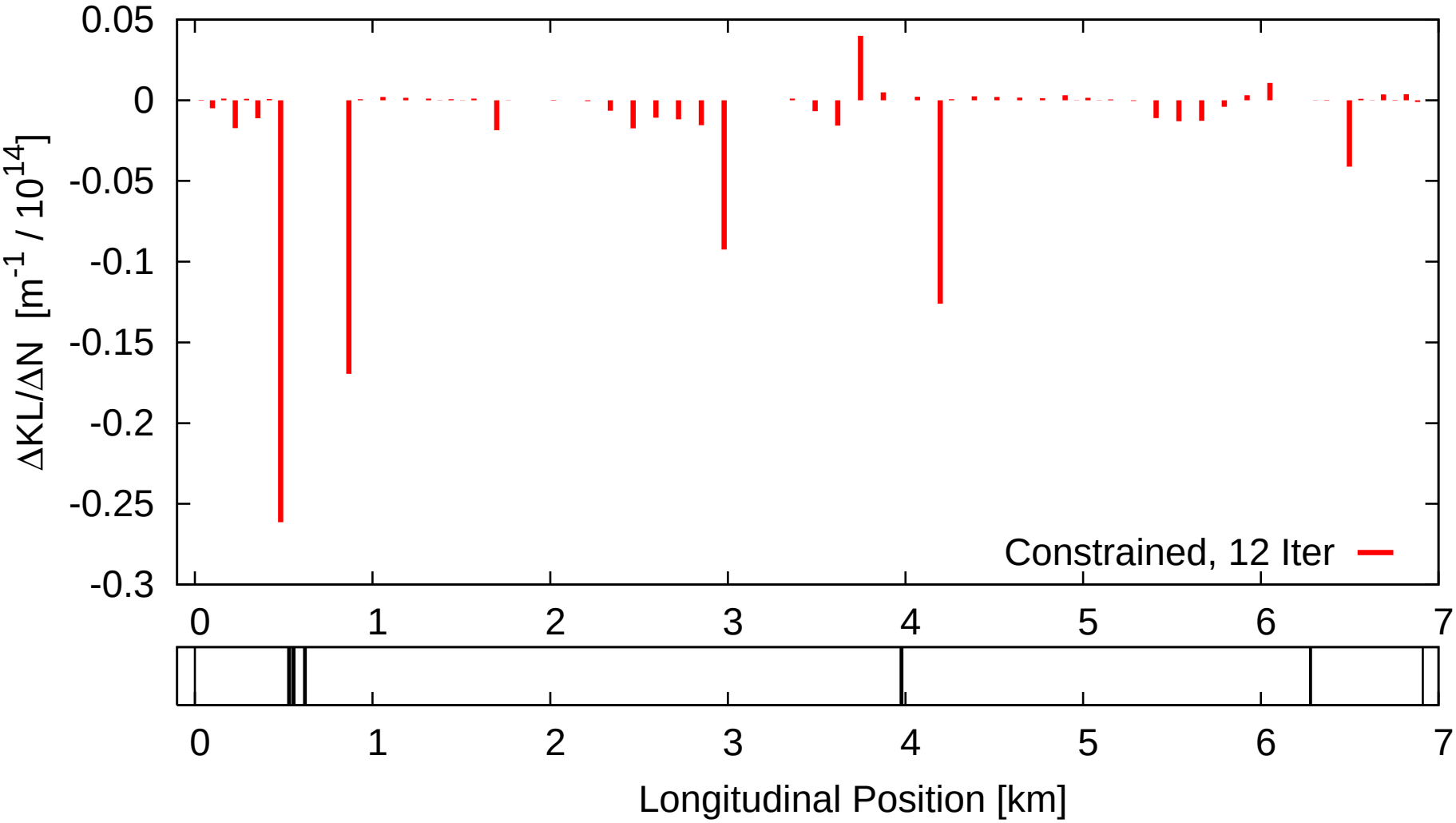


Intensity Fitted Slope $\{\Delta\phi_{a\rightarrow b}\}$

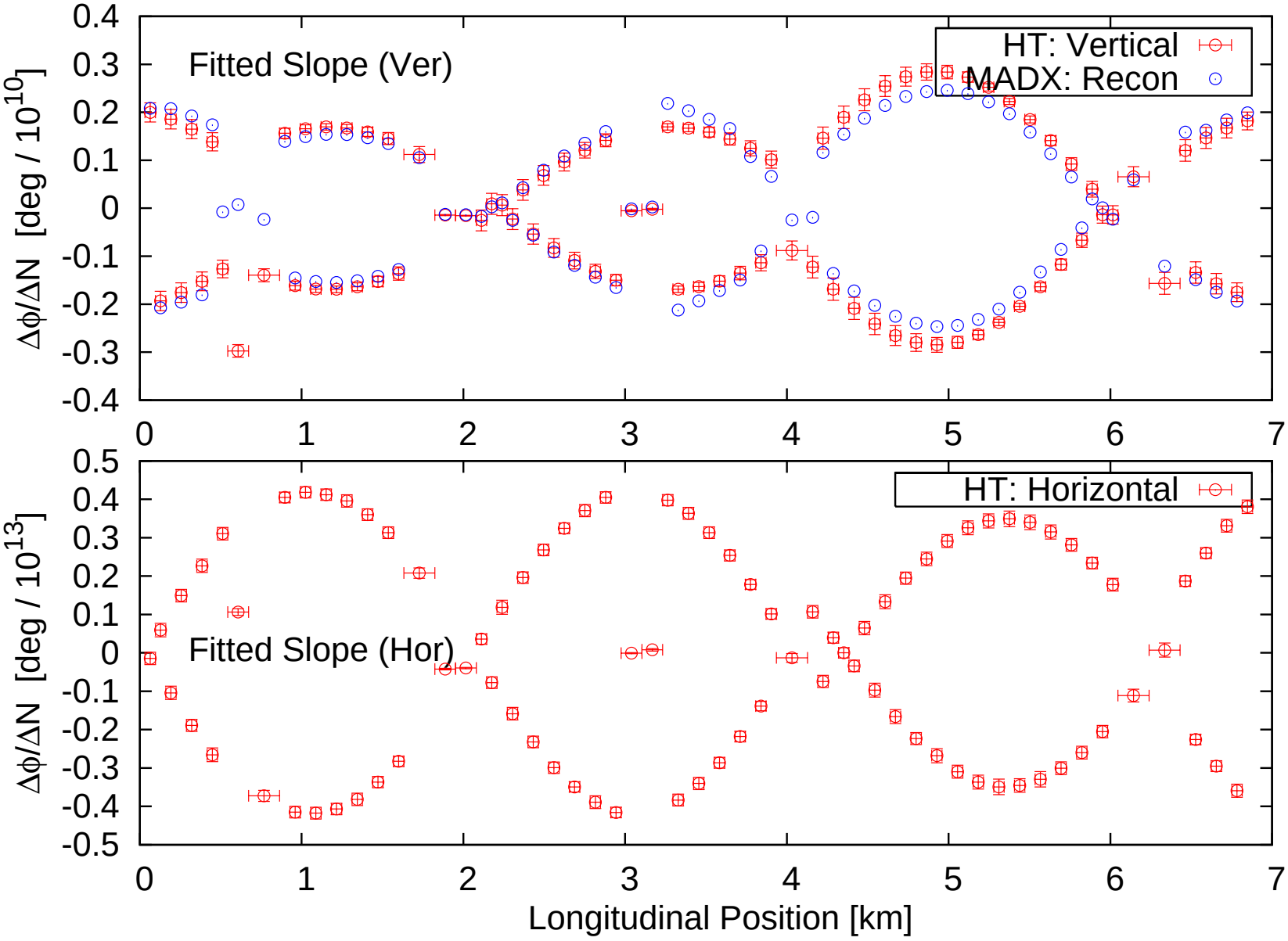


Constrained Recon ΔK_i (Iterative)

$$[R, \vec{\lambda} I]\Delta\vec{K} = [\Delta\vec{\phi}, 0]^T \quad \{\Delta K_i < 0, \quad \text{QDs}\}$$



Intensity Fitted Slope $\{\Delta\phi_{a\rightarrow b}\}$



Some Key Points

- All quads (232) seem to reproduce a cleaner signal compared to just QDs (108)
- SVD cut to be carefully evaluted for each data set (2×10^{-3})
- "Best corrector" type algorithm is under development
- Append only vertically or horizontally focusing-defocusing matrices to each quads to expand observable space (idea from R. Tomás)
- Iteration steps only for weight determination, don't keep previous solutions (revisit SPS data analysis)