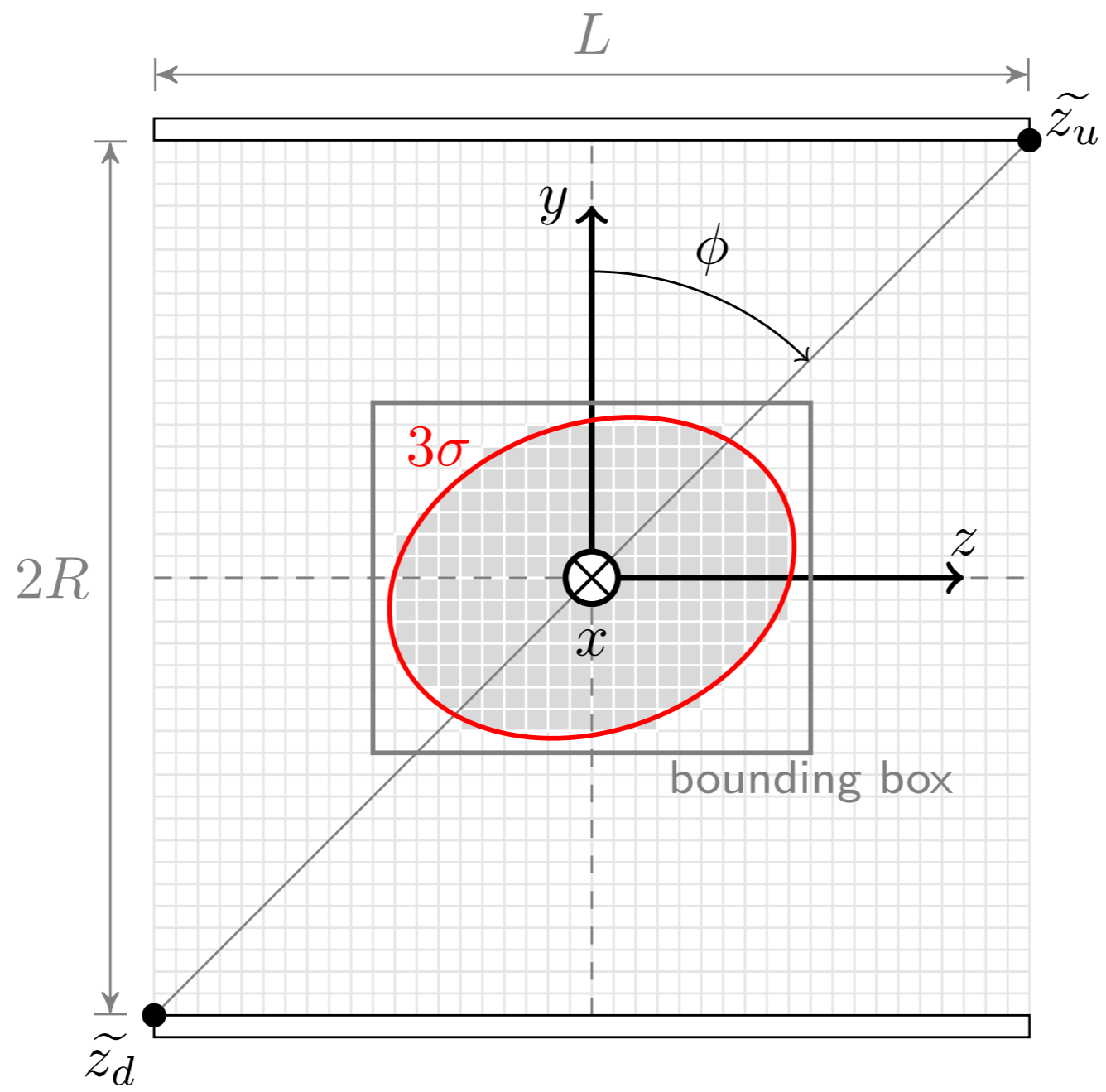


~~3D~~ 2D reconstruction in  
J-PET

# List mode MLEM

$$\rho_l^{(t+1)} = \sum_{j=1}^N \frac{P(\tilde{\mathbf{e}}_j | l) \rho_l^t}{\sum_{i=1}^M P(\tilde{\mathbf{e}}_j | i) s_i \rho_i^t}.$$

$$\tilde{\mathbf{e}} = (\tilde{z}_{up}, \tilde{z}_{dn}, \Delta l)$$



# Kernel

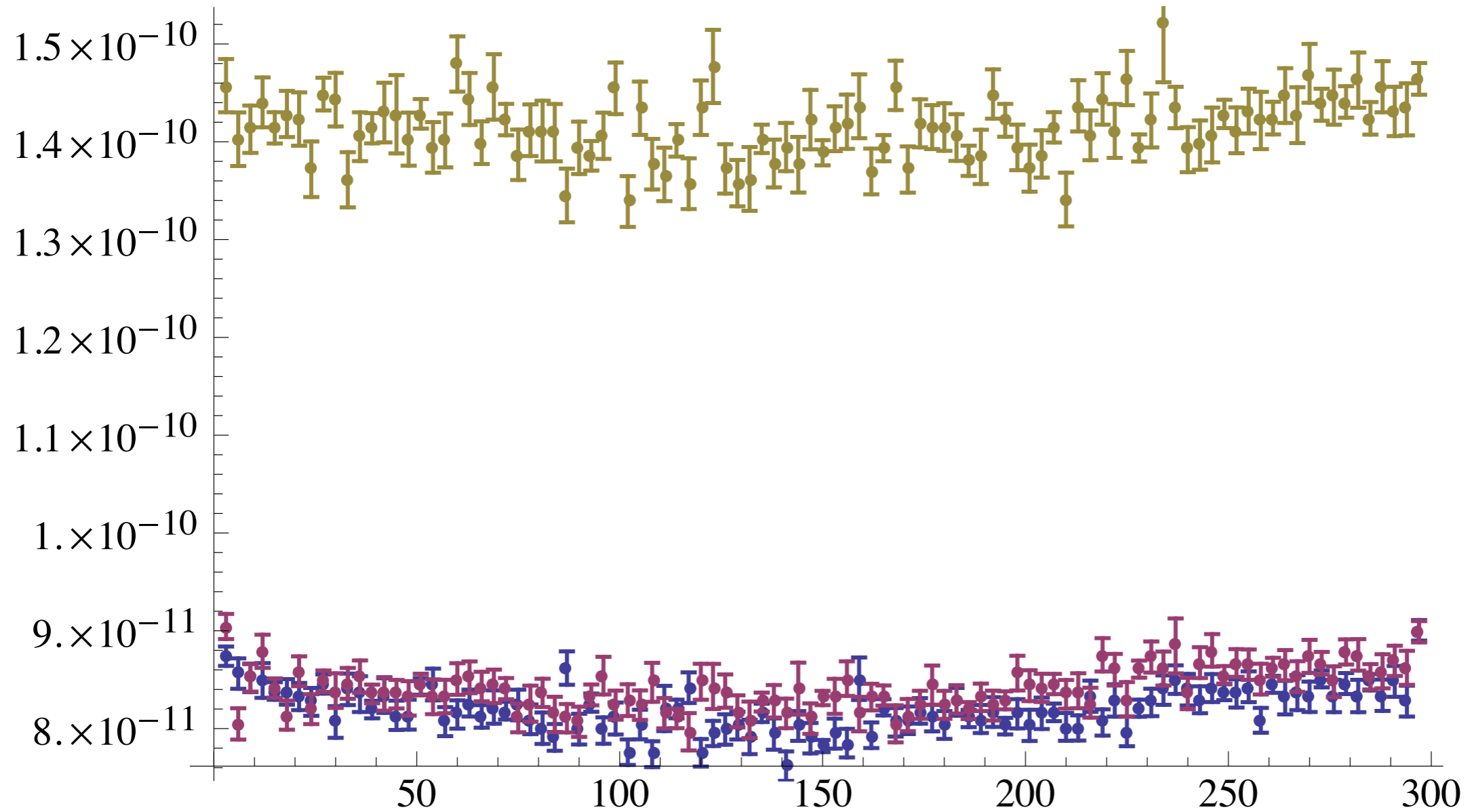
$$P(\tilde{\mathbf{e}}|i) \approx \frac{\det^{\frac{1}{2}} C}{2\pi} \exp\left(-\frac{1}{2}\vec{b}C^{-1}\vec{b}\right)$$

$$\vec{b} = \begin{pmatrix} \Delta z - \Delta y \tan \tilde{\theta} \\ \Delta z - \Delta y \tan \tilde{\theta} \\ -2\Delta y \cos^{-1} \tilde{\theta} \end{pmatrix},$$

# Corelation matrix

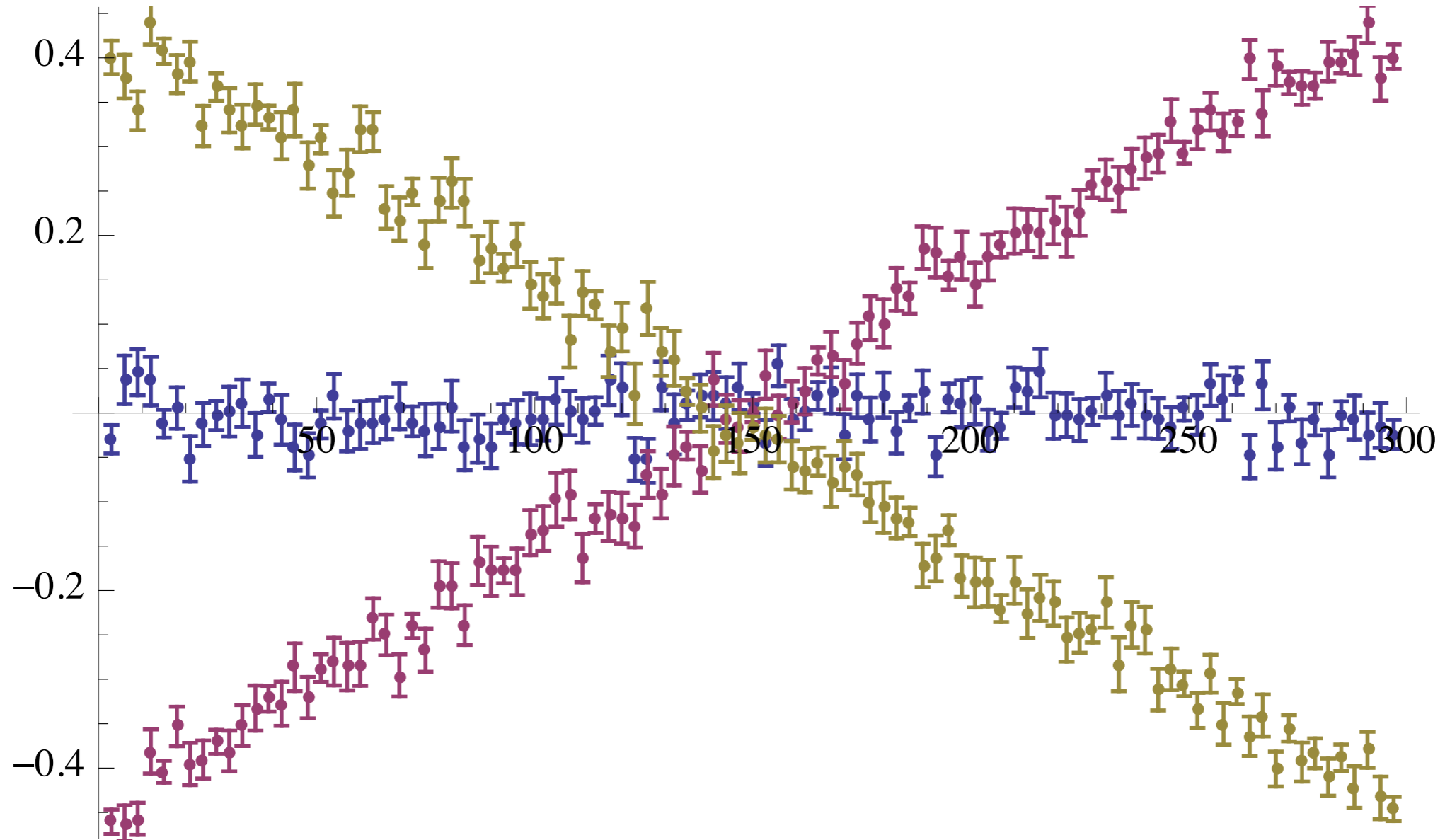
$$\begin{pmatrix} \sigma_z^2 & 0 & cov \\ 0 & \sigma_z^2 & -cov \\ cov & -cov & \sigma_{dl}^2 \end{pmatrix} = \sigma_z \sigma_{dl} \begin{pmatrix} q & 0 & cor \\ 0 & q & -cor \\ cor & -cor & 1/q \end{pmatrix}$$

# Errors



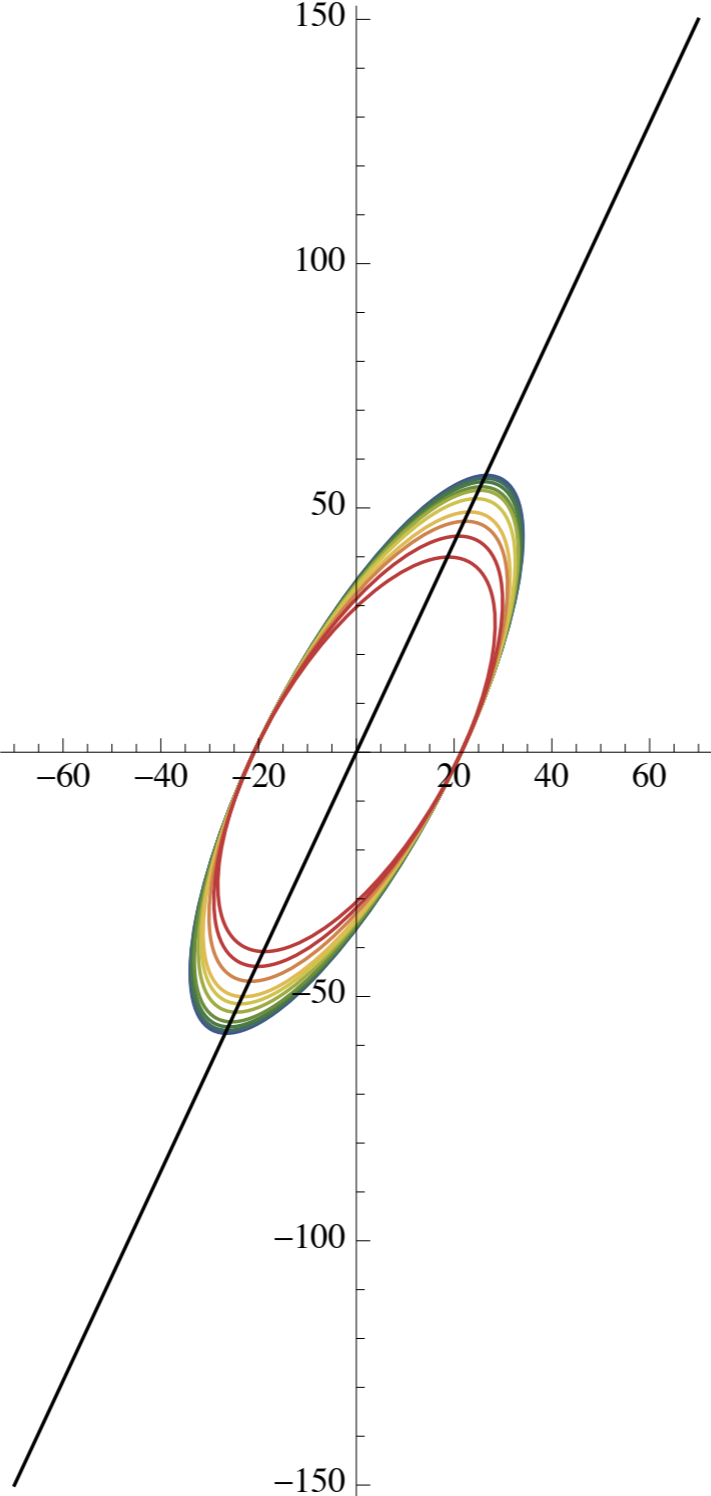
Unofficial!

# Correlations



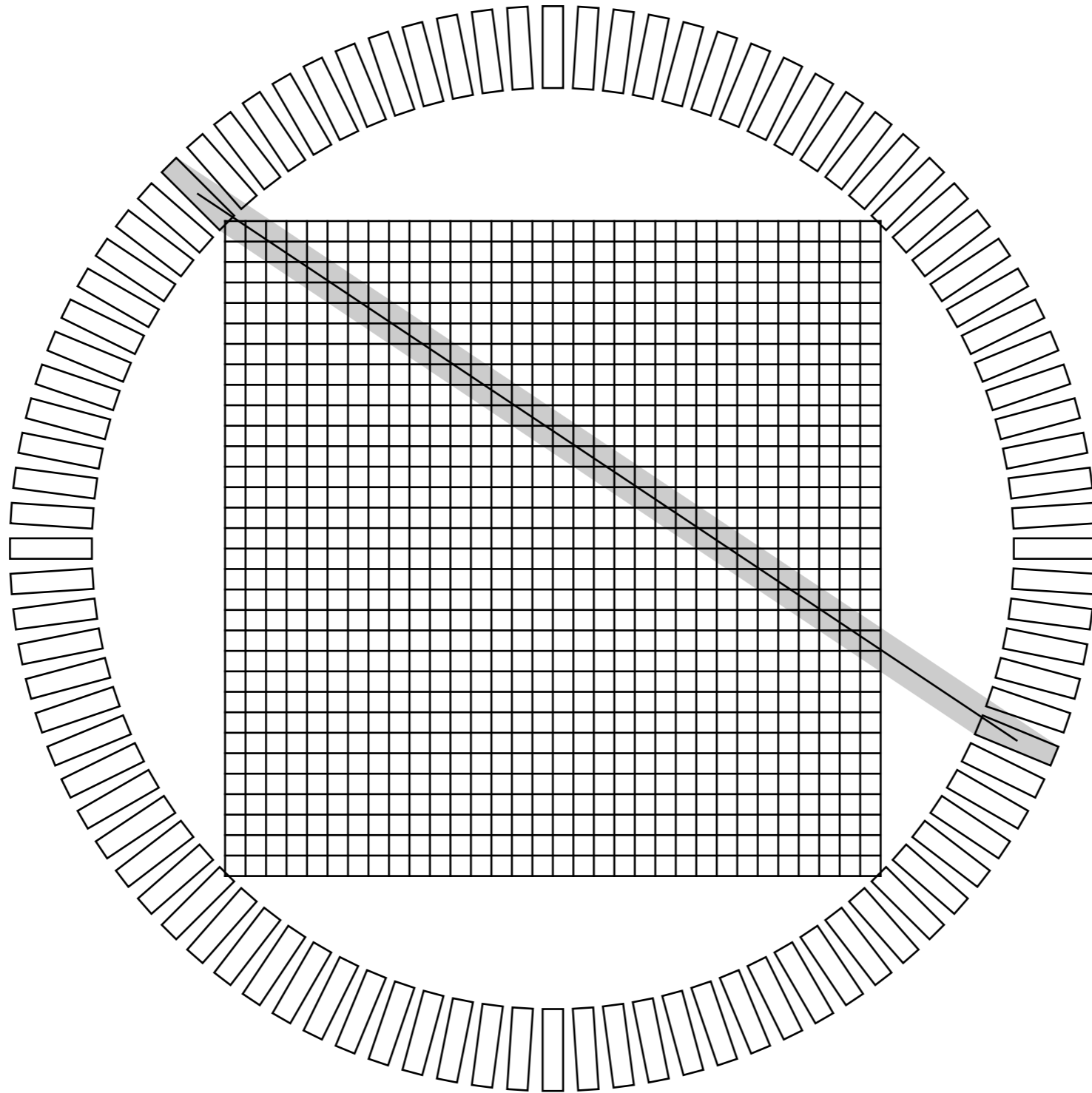
Unofficial !

# Kernel

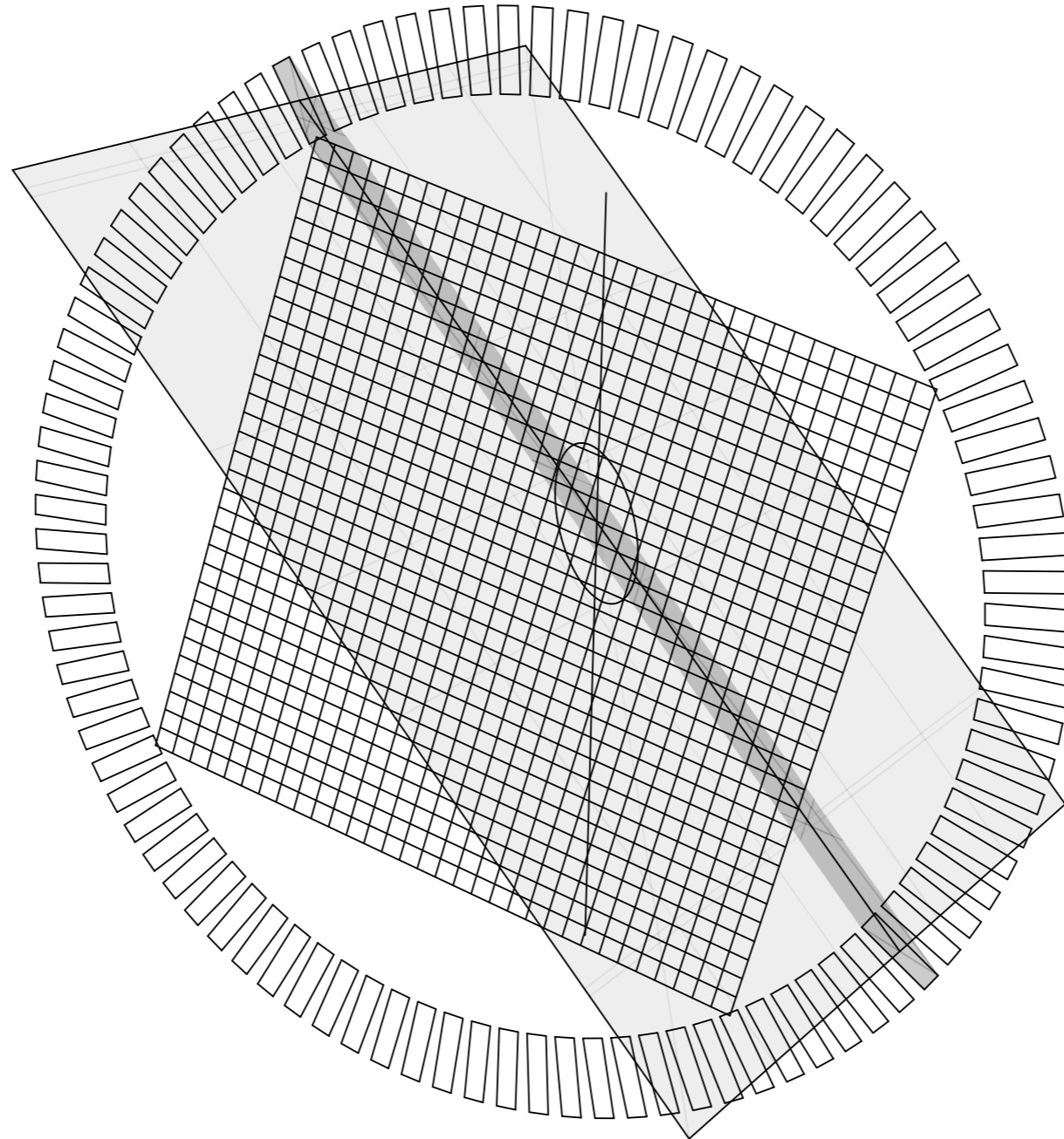




3D



3D



# Summary

- Pictures coming up in next talk :)
- Fairly good grasp of errors and correlations.
- Can assume uncorrelated errors.
- 2D reconstruction from real data coming soon.
- 3D reconstruction in progress.