SIMPLIFICATIONS

- t_i used to multiply B0 by in A increase only in discrete steps for each phase-encode step
- Ignore any susceptibility in frequency-encode direction

$$\mathbf{K} = \begin{bmatrix} \underbrace{\mathbf{K}_1}_{n\times n} & \mathbf{0} & \cdots & \mathbf{0} \\ \mathbf{0} & \underbrace{\mathbf{K}_2}_{n\times n} & \cdots & \mathbf{0} \\ \vdots & \vdots & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \cdots & \underbrace{\mathbf{K}_n}_{n\times n} \end{bmatrix}$$

$$\hat{\boldsymbol{\rho}}_i = \mathbf{K}_i{}^{+}\mathbf{f}_i$$

$$\mathbf{F}_{jk} = e^{-2\pi\sqrt{-1}\frac{\left(j-\frac{n}{2}-1\right)\left(k-\frac{n}{2}-1\right)}{n}}, \quad j,k = 1,2,\ldots,n$$

$$[\mathbf{A}_i]_{jk} = e^{-2\pi\sqrt{-1}\left(\frac{\left(j-\frac{n}{2}-1\right)\left(k-\frac{n}{2}-1\right)}{n} + \frac{j}{n}\Delta B_0(x_i, y_k)\right)}$$

$$A^{+} = (A^T A)^{-1} A^T$$

Kadah and Hu, 1997

INVERSE PROBLEMS

- Does the inverse of K exist?
- What about $\begin{bmatrix} \mathbf{K}_+ \\ \mathbf{K}_- \end{bmatrix}^+$?
-

$$\underbrace{\begin{bmatrix} \mathbf{f}_+ \\ \mathbf{f}_- \end{bmatrix}}_{2n\times 1} = \underbrace{\begin{bmatrix} \mathbf{K}_+ \\ \mathbf{K}_- \end{bmatrix}}_{2n\times n} \underbrace{\boldsymbol{\rho}}_{n\times 1}$$

-

$$\hat{\boldsymbol{\rho}} = \left([\mathbf{K}_+^T \quad \mathbf{K}_-^T] \begin{bmatrix} \mathbf{K}_+ \\ \mathbf{K}_- \end{bmatrix} \right)^{-1} [\mathbf{K}_+^T \quad \mathbf{K}_-^T] \begin{bmatrix} \mathbf{f}_+ \\ \mathbf{f}_- \end{bmatrix}$$