THE ALGORITHM

The gradient of $F_{DV}^{(L)}$ with respect to $\vec{\psi}$ @ fixed q is

$$\nabla_{\vec{\psi}}\,\mathbf{p}^{(L)} = -\nabla_{\vec{\psi}}\,R\mathbf{L}^{(L)}.(-\mathbf{c}^{(L)}) - R\mathbf{L}^{(L)}.(-\nabla_{\vec{\psi}}\,\mathbf{c}^{(L)}) + \nabla_{\vec{\psi}}\,\vec{\beta}^{(L)}$$

where

$$\mathbf{P}^{(L)}.(-\nabla_{\vec{\psi}}\,\mathbf{c}^{(L)}) = \nabla_{\vec{\psi}}\,\mathbf{P}^{(L)}.(-\mathbf{c}^{(L)}) - \nabla_{\vec{\psi}}\,\mathbf{g}^{(L)}.$$

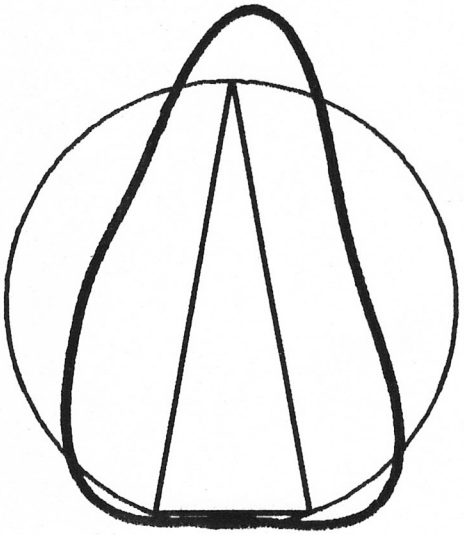
FEATURES

1) ♦ The scattering data are $\{A[\mathbf{k}_q\,;\phi_j\,;\gamma_q\,], j \in N_q\,, q \in Q\}$.
2) ♦ Superposition of limited aperture – multiple views allowed.
3) ♦ The cost function to be minimized is $F_{DV}^{(L)}[\vec{\psi}\,,\,\vec{\gamma}\,]$.
4) ♦ The unknowns are $\vec{\psi} \in \Psi_{\text{adm}}$ and $\vec{\gamma} \in ([0, 2\pi\,])^{\text{card}[Q]}$.
5) The DIRICHLET BC and the boundary to far zone relation are re–presented by approximate forward propagation.
6) $\mathbf{P}_q{}^{(L)}$, $R\mathbf{L}_q{}^{(L)}$ depend on $\vec{\psi}$ and on k_q (not on $\mathbf{k}_q$).
7) $\{\vec{\beta}_q^{(L)}\}$ and $\{\mathbf{g}_q^{(L)}\}$ depend on $\vec{\psi}$ and on $\mathbf{k}_q$.
8) ♦ Only $\mathbf{P}_q{}^{(L)}$ has to be inverted; $[\mathbf{P}_q^{(L)}\,]^{-1}$ $\exists$ unconditionally.

NUMERICAL RESULTS FROM $F_{DV}^{(L)}$ MINIMIZATION

IPSWICH files *ips009/ips009FV.**

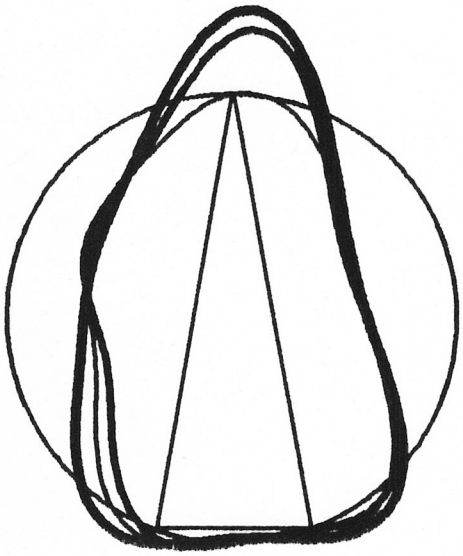
Full aperture data obtained via reciprocity of $A[\mathbf{k}_q\ ;\ \phi_j\ ;\ \gamma_q]$



$\{\mathbf{k}_q\ ,\ 1 \le q \le 4\}$
$L = 12, I = 10$

$$\frac{\psi_4^{(0)}}{\psi_1^{(0)}} = -0.4$$

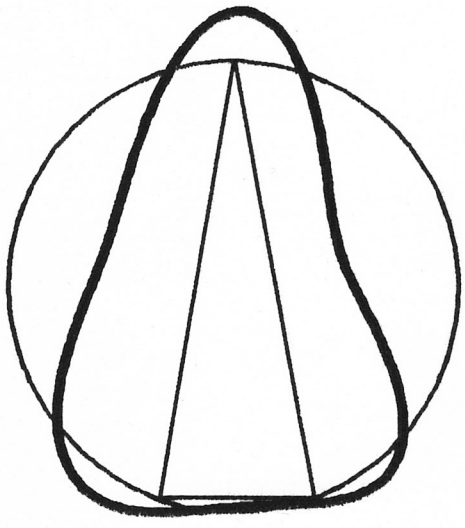
MF9x4CA r_0 = .495868D+01 It.= 15
$B^{[12]}$ = .425680D̄+03 ; $\|\nabla B\|$ = .258242D+05



$\{\mathbf{k}_q\ ,\ 1 \le q \le 5\}$
$L = 12, I = 10$

$$\frac{\psi_4^{(0)}}{\psi_1^{(0)}} = -0.4$$

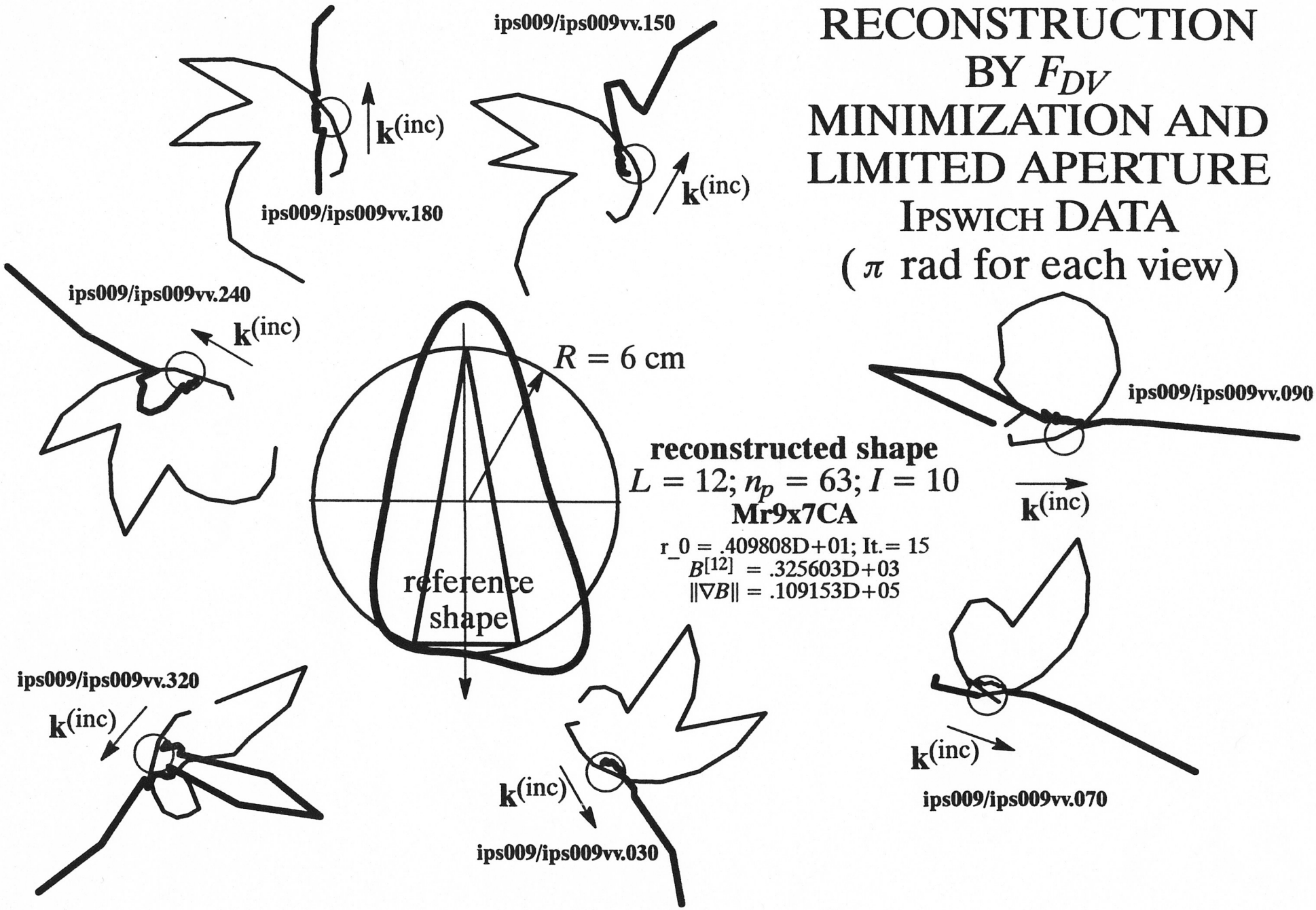
MF9x5CA r_0 = .495868D+01 It.= 15
$B^{[12]}$ = .485822D̄+03 ; $\|\nabla B\|$ = .195682D+05
MF9x5CA r_0 = .409808D+01 It.= 15
$B^{[12]}$ = .494881D̄+03 ; $\|\nabla B\|$ = .177667D+05
MF9x5CA r_0 = .450789D+01 It.= 15
$B^{[12]}$ = .514020D̄+03 ; $\|\nabla B\|$ = .195457D+05

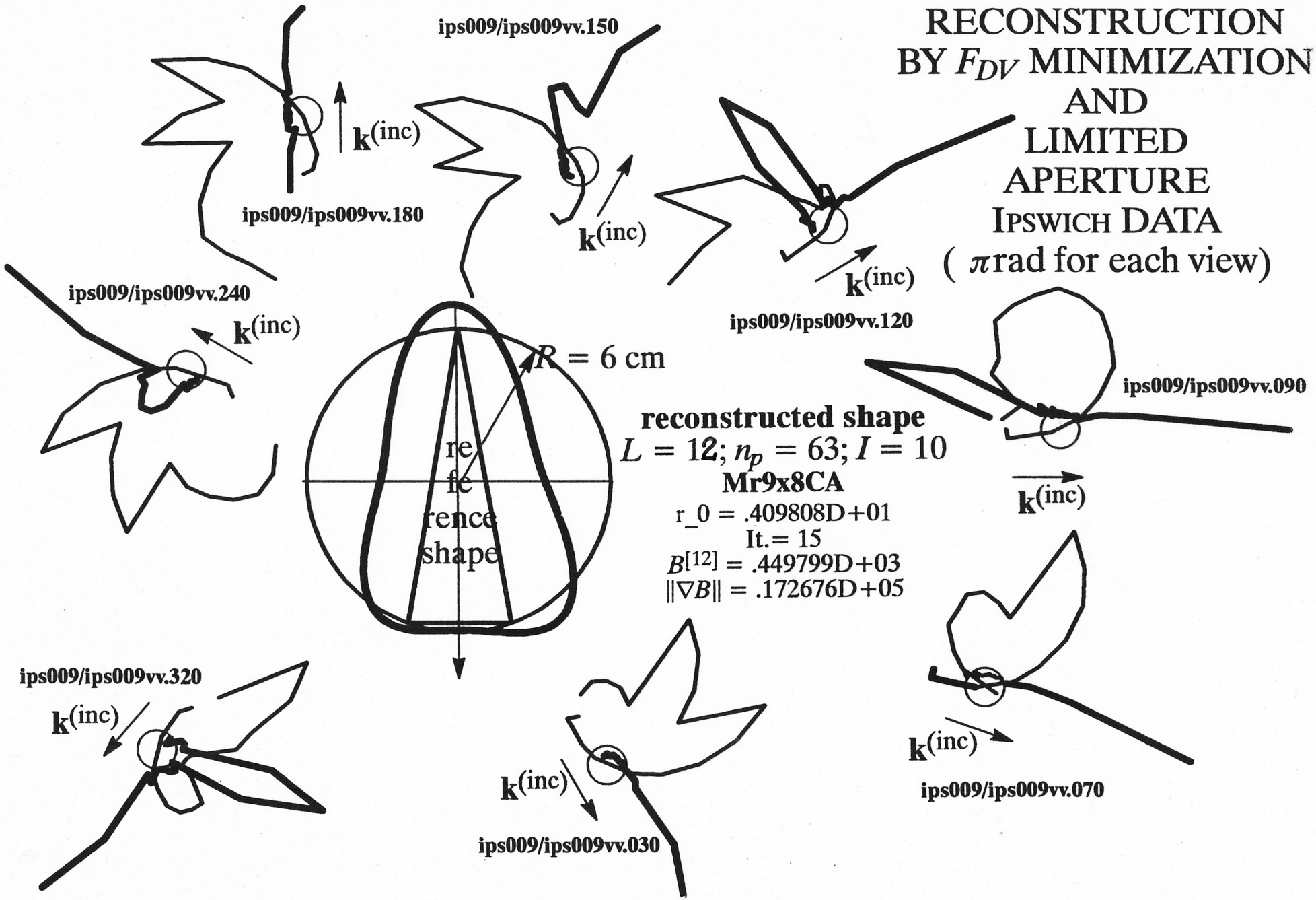


$\{\mathbf{k}_q\ ,\ 1 \le q \le 5\}$
$L = 14, I = 10$

$$\frac{\psi_4^{(0)}}{\psi_1^{(0)}} = -0.4$$

MF9x5EA r_0 = .495868D+01 It.= 15
$B^{[14]}$ = .464231D̄+03 ; $\|\nabla B\|$ = .537194D+05


RECONSTRUCTION
BY F_{DV}
MINIMIZATION AND
LIMITED APERTURE
IPSWICH DATA
(π rad for each view)
ips009/ips009vv.150
ips009/ips009vv.180
ips009/ips009vv.240
ips009/ips009vv.090
ips009/ips009vv.320
ips009/ips009vv.030
ips009/ips009vv.070
k(inc)
R = 6 cm
reference
shape
reconstructed shape
L = 12; n_p = 63; I = 10
Mr9x7CA
r_0 = .409808D+01; It.= 15
$B^{[12]}$ = .325603D+03
$\|\nabla B\|$ = .109153D+05


RECONSTRUCTION
BY F_{DV} MINIMIZATION
AND
LIMITED
APERTURE
IPSWICH DATA
(πrad for each view)
ips009/ips009vv.150
ips009/ips009vv.180
ips009/ips009vv.120
ips009/ips009vv.240
ips009/ips009vv.090
ips009/ips009vv.320
ips009/ips009vv.030
ips009/ips009vv.070
k(inc)
R = 6 cm
reference shape
reconstructed shape
$L = 12; n_p = 63; I = 10$
Mr9x8CA
r_0 = .409808D+01
It.= 15
$B^{[12]}$ = .449799D+03
$\|\nabla B\|$ = .172676D+05

RECONSTRUCTION BY F_{DV} MINIMIZATION AND LIMITED APERTURE IPSWICH DATA (π rad for each view)