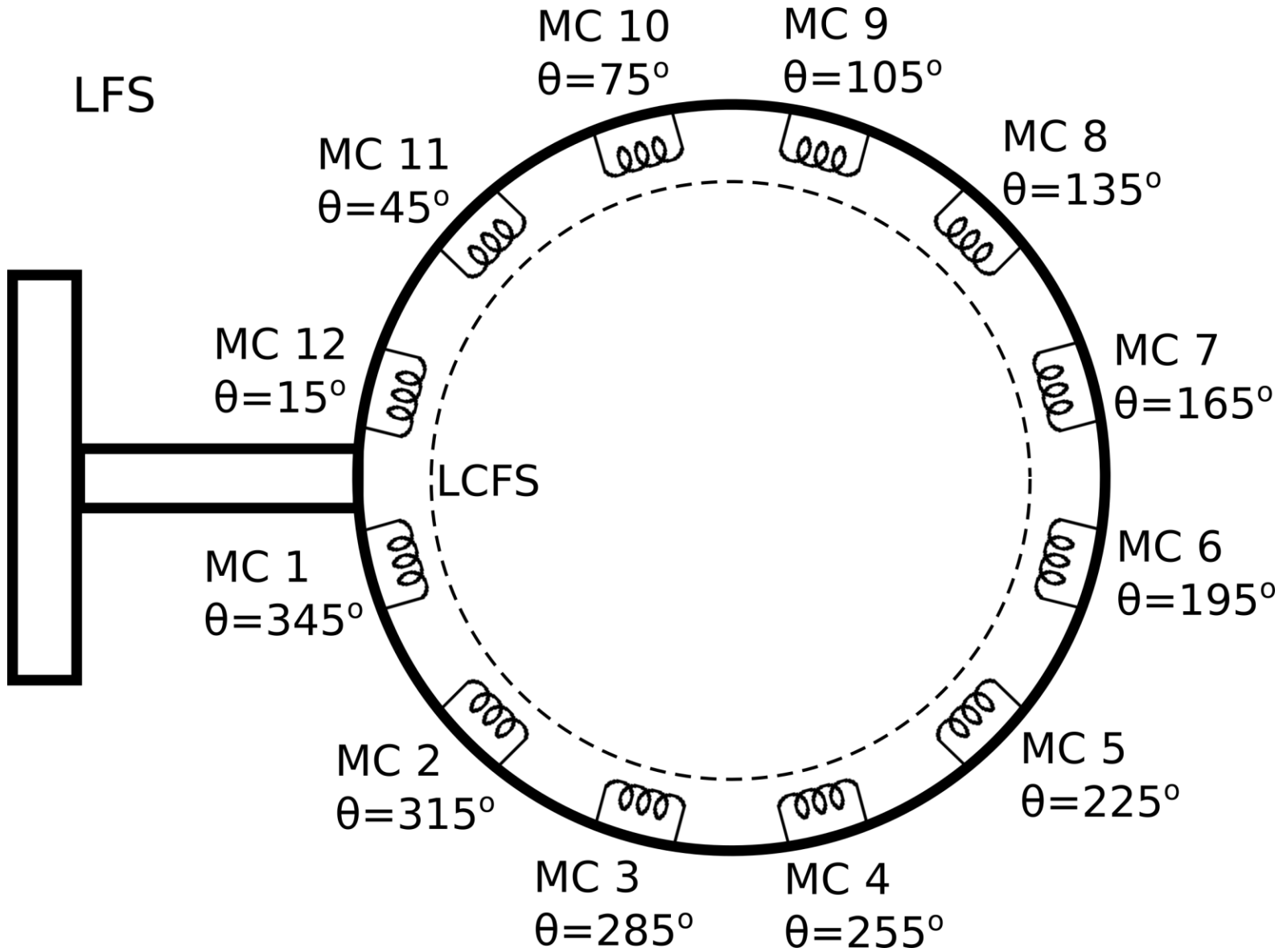
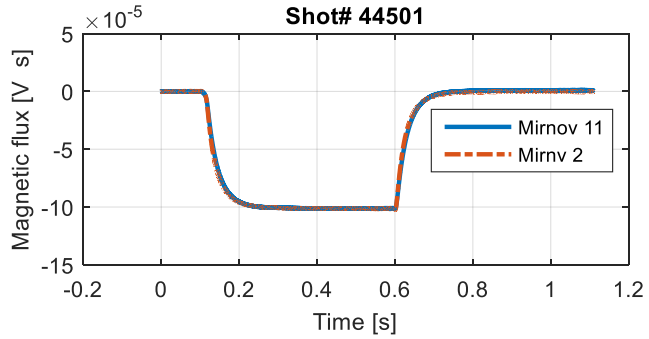
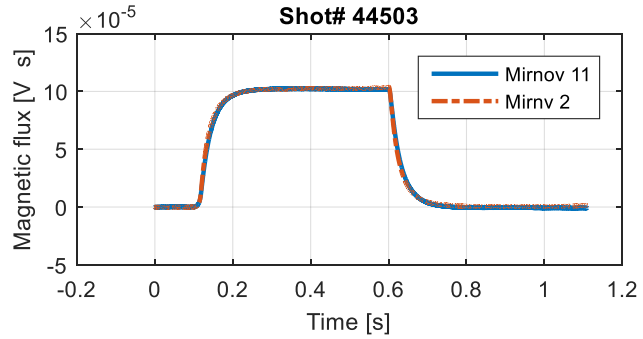
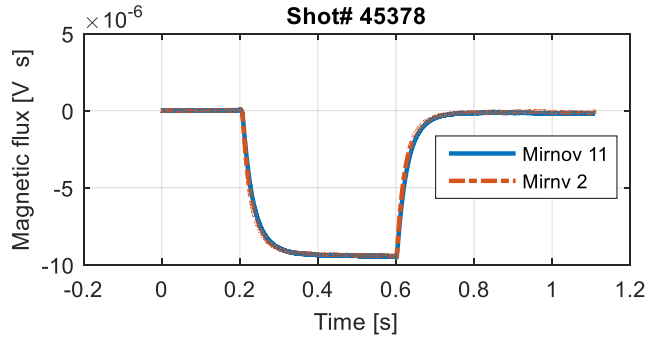
ISTTOK Mirnov calibration and current centroid position optimization

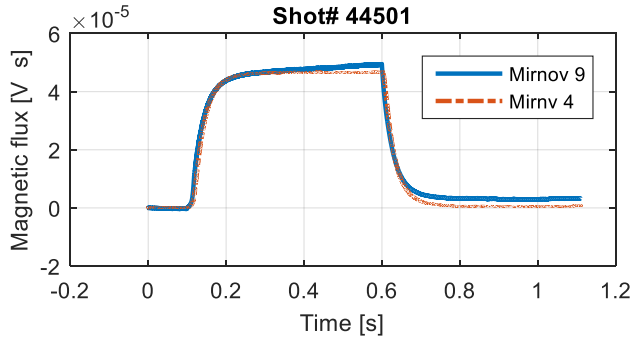

LFS
MC 10
θ=75°
MC 9
θ=105°
MC 11
θ=45°
MC 8
θ=135°
MC 12
θ=15°
MC 7
θ=165°
LCFS
MC 1
θ=345°
MC 6
θ=195°
MC 2
θ=315°
MC 5
θ=225°
MC 3
θ=285°
MC 4
θ=255°

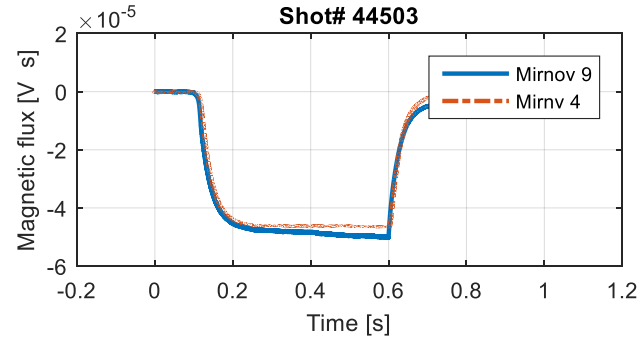
Heaviside Primary PFC

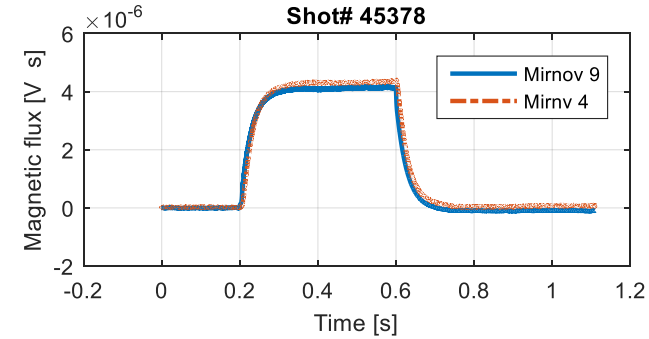


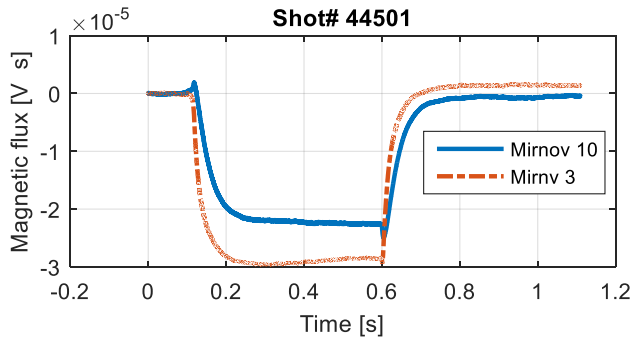


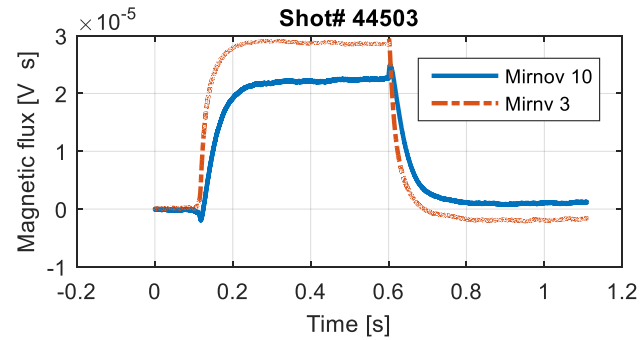


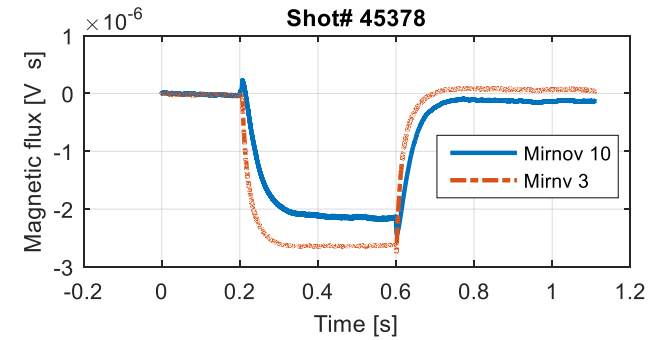




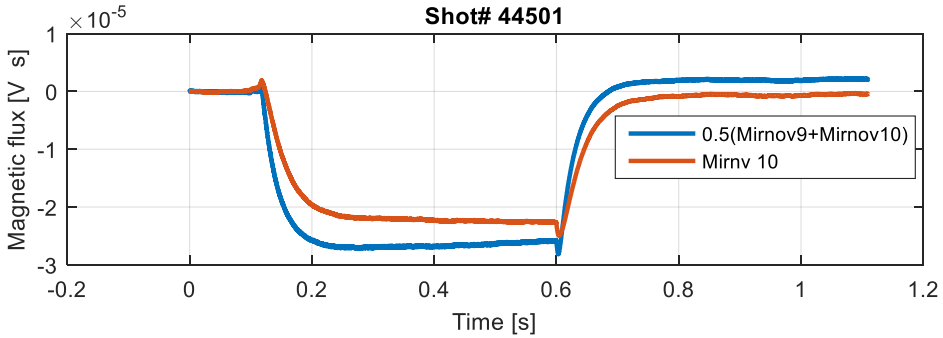


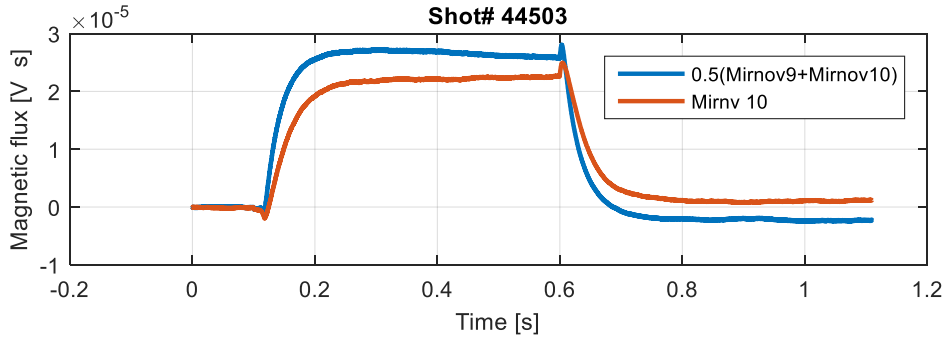


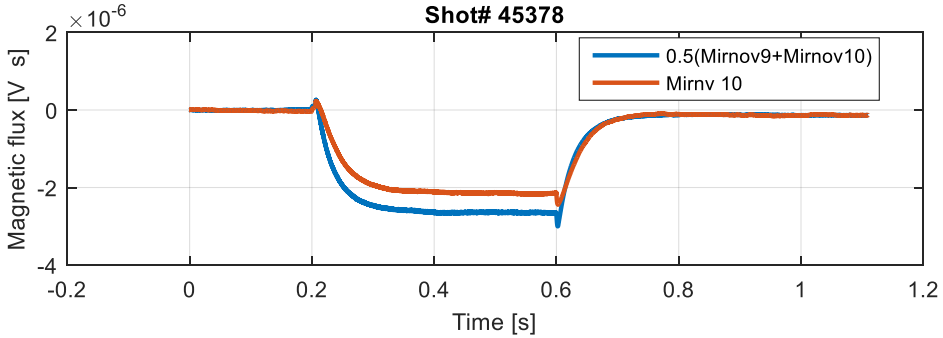


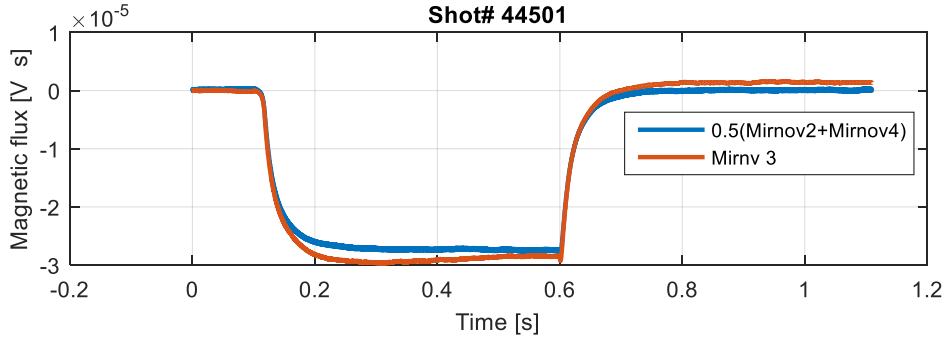


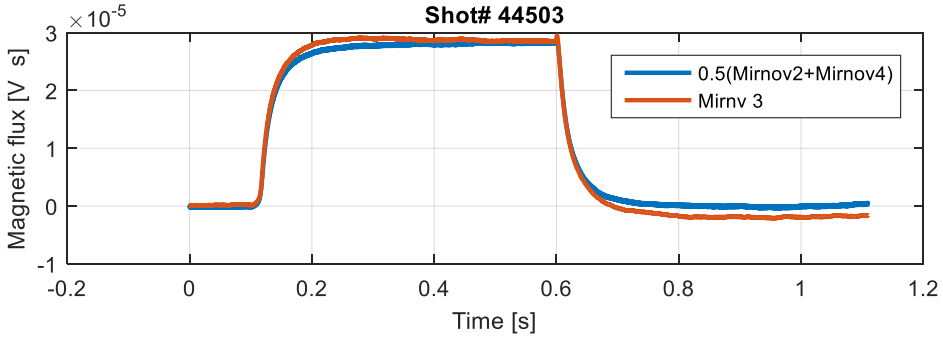
Semi-Sum comparition

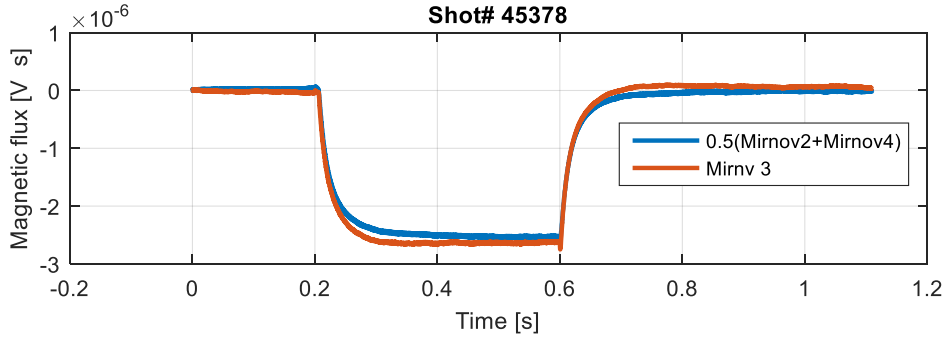












Correction factor (Reference $Mirnov_3$)

Shot # 44501 and # 44503

$Factor_{mirnv10} = 1.2988$

$Factor_{mirnv10} = 1.2953$

Shots from October 2018

Shot # 45378

$Factor_{mirnv10} = 1.2487$

Shots from January 2019 , the offset correction in the Mirnov 3 is slightly more accurate (probably due to external causes, ex. Cable in different position)

$\boldsymbol{Factor_{mirnv10} = 1.2803}$

One filament, optimization

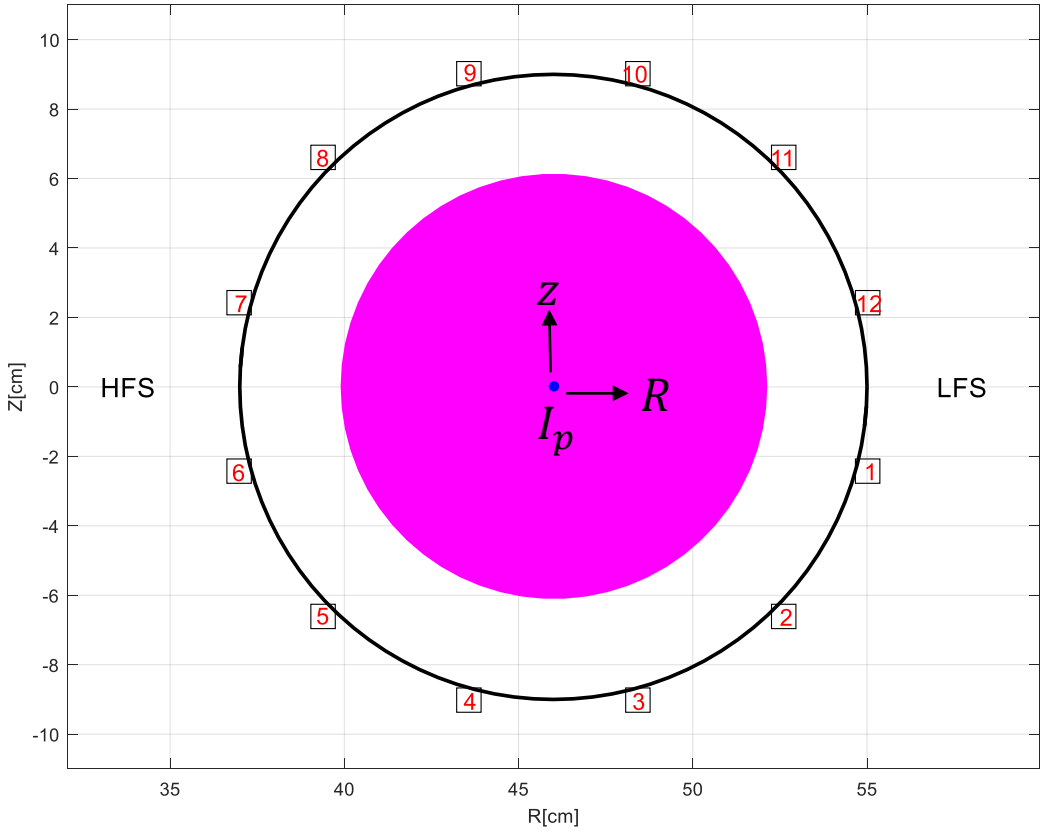
Minimization of the error

Degrees of freedom I_p, R, z

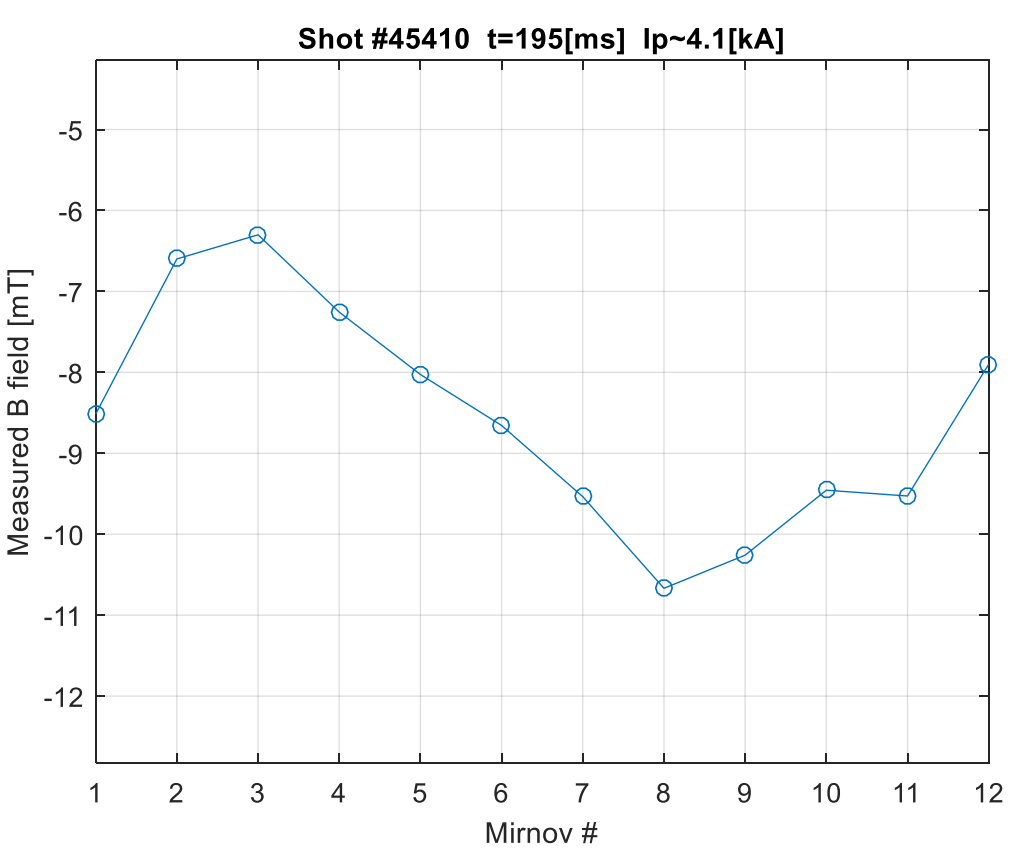
Mirnov measurements $\tilde{B}_{mirnv}$

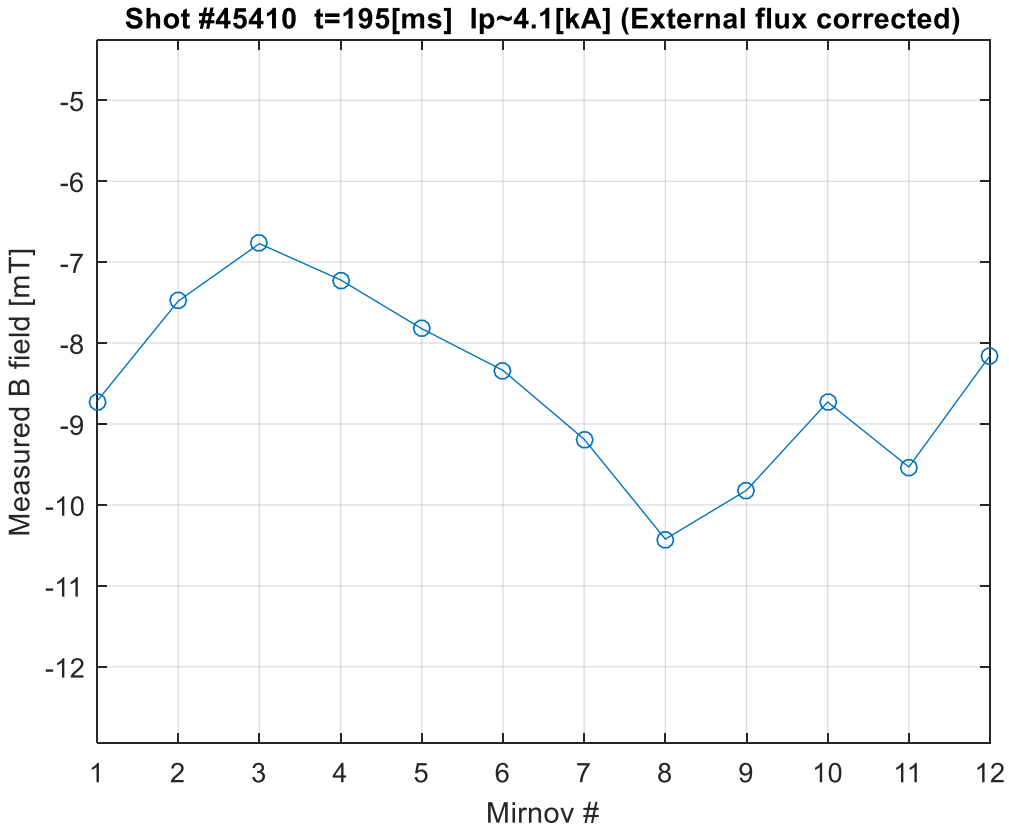
$$\sum_{i=1}^{12} \left| \tilde{B}_{mirnv} - B_{mirnv}(I_p, R, z) \right| = \text{Error}$$

- Plasma current : Single wire in the center of the chamber



Shot # 45410 t=195[ms]



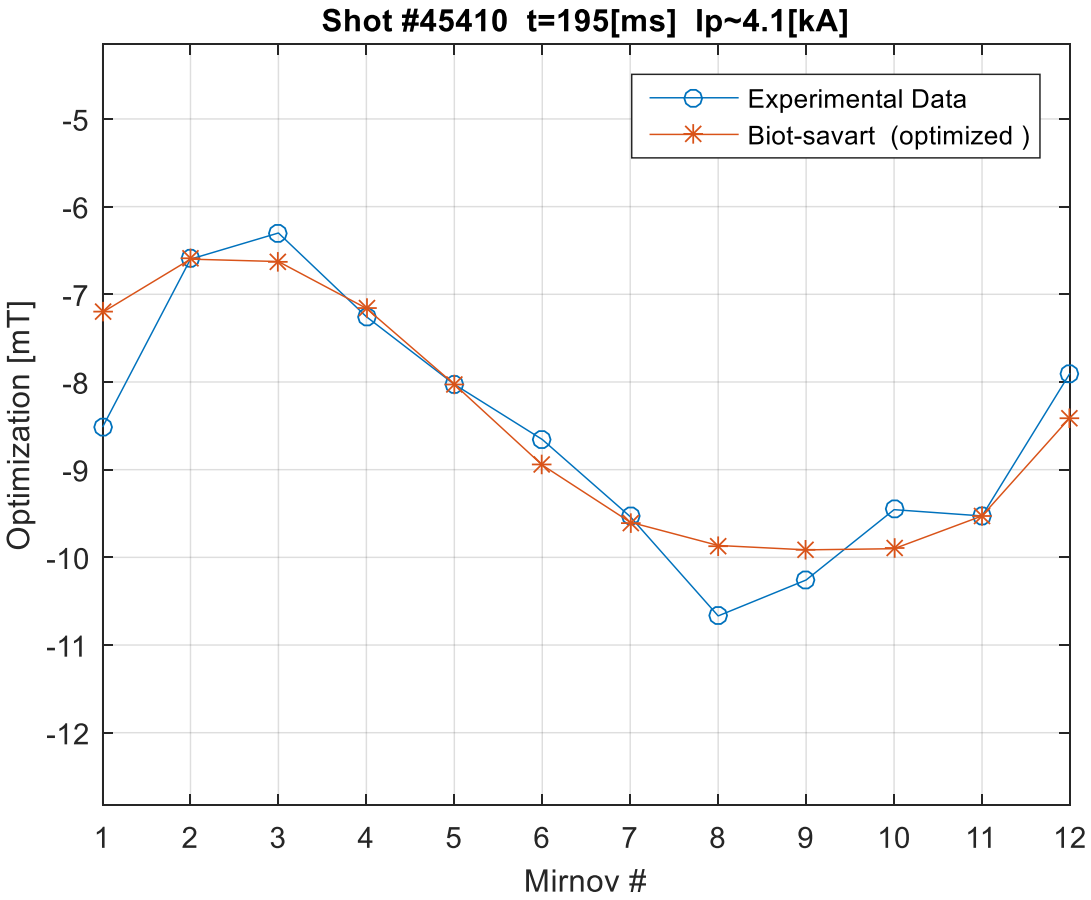


Optimization values

$I_p = 3.7268\ [kA]$

$z = 1.7\ [cm]$

$R = 48.5\ [cm]$

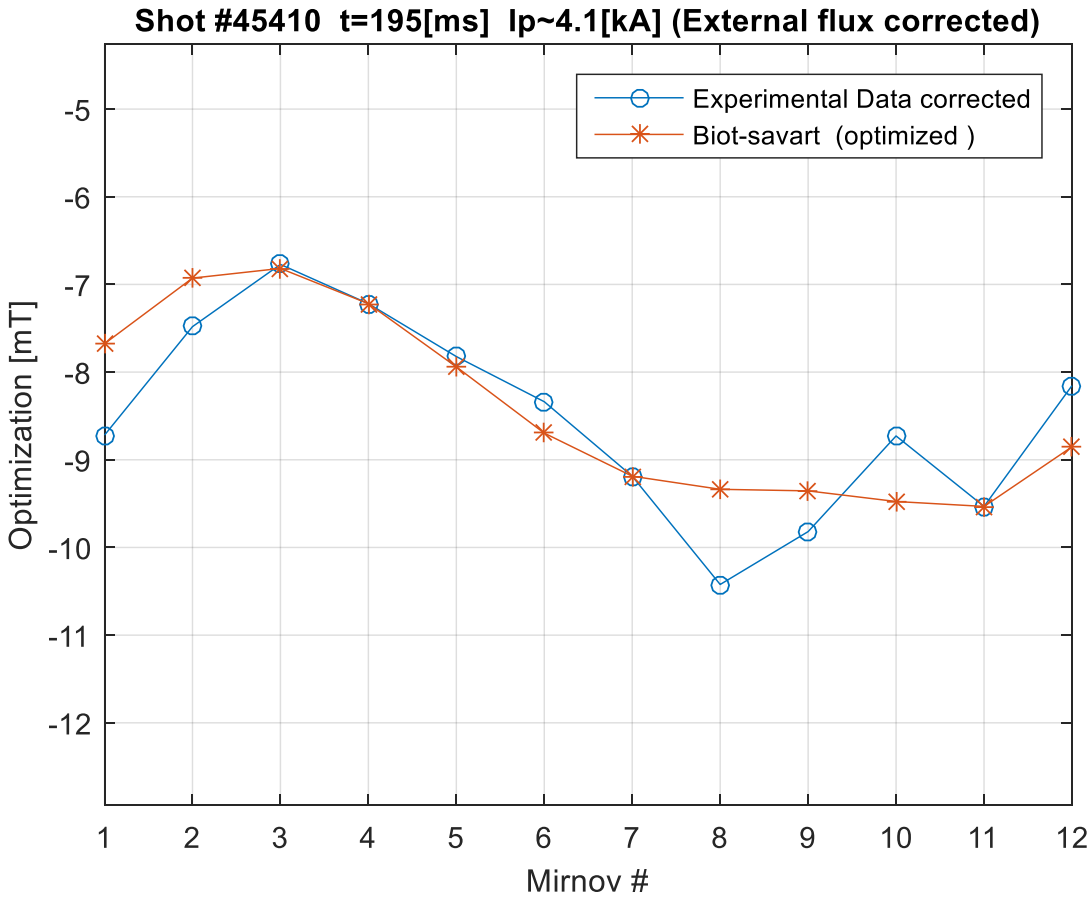


$RMSE = 0.0767[mT]$

$I_p = 3.666\ [kA]$

$z = 1.4\ [cm]$

$R = 48.9\ [cm]$



$RMSE = 0.09831[mT]$

Multi-filament, optimization

Minimization of the error

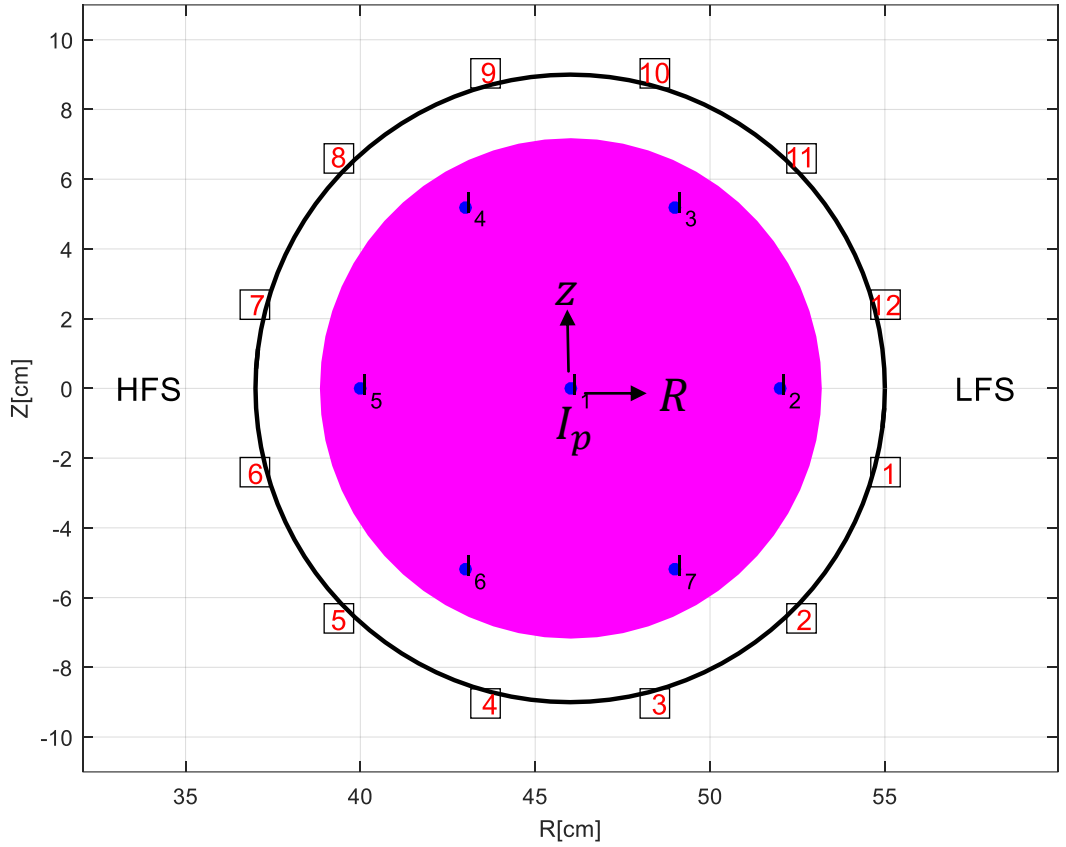
Degrees of freedom(Fil 1) I_p, R, z

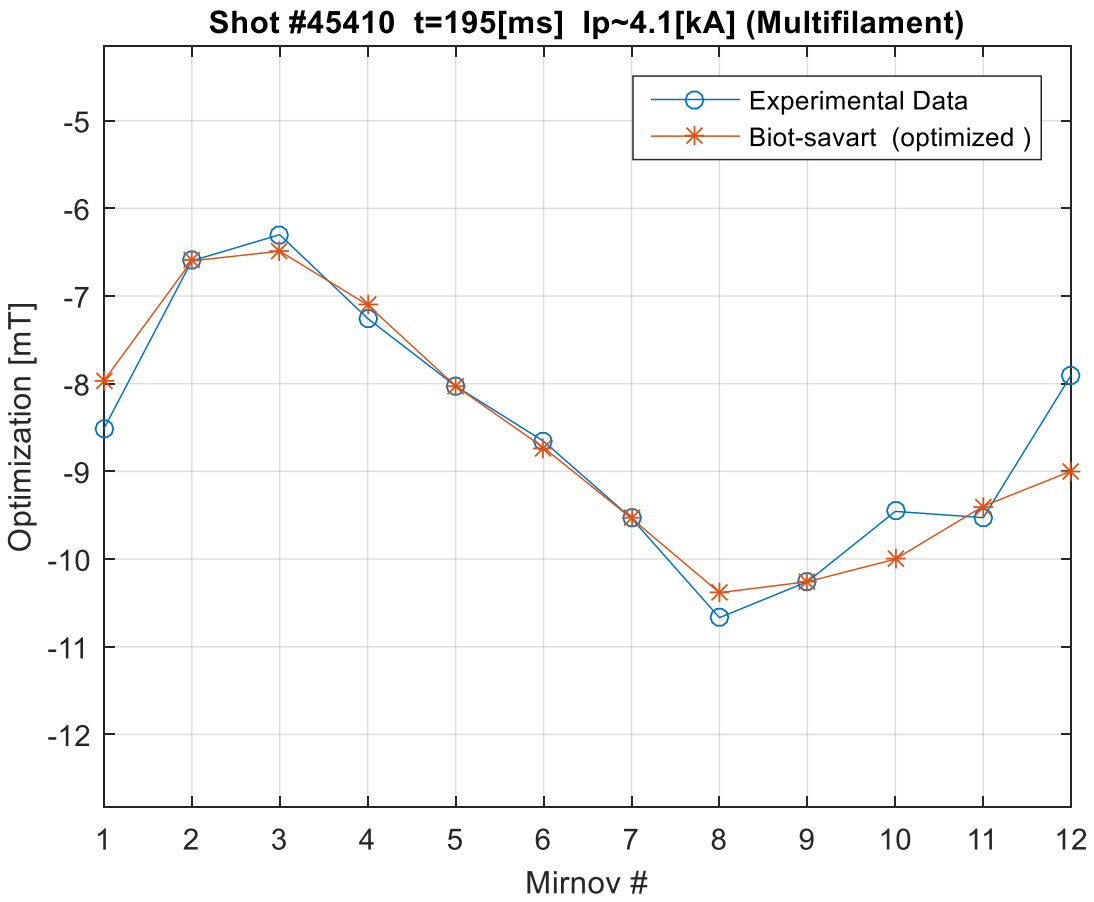
Degrees of freedom (Fil 2-7) I_p

Mirnov measurements $\tilde{B}_{mirnv}$

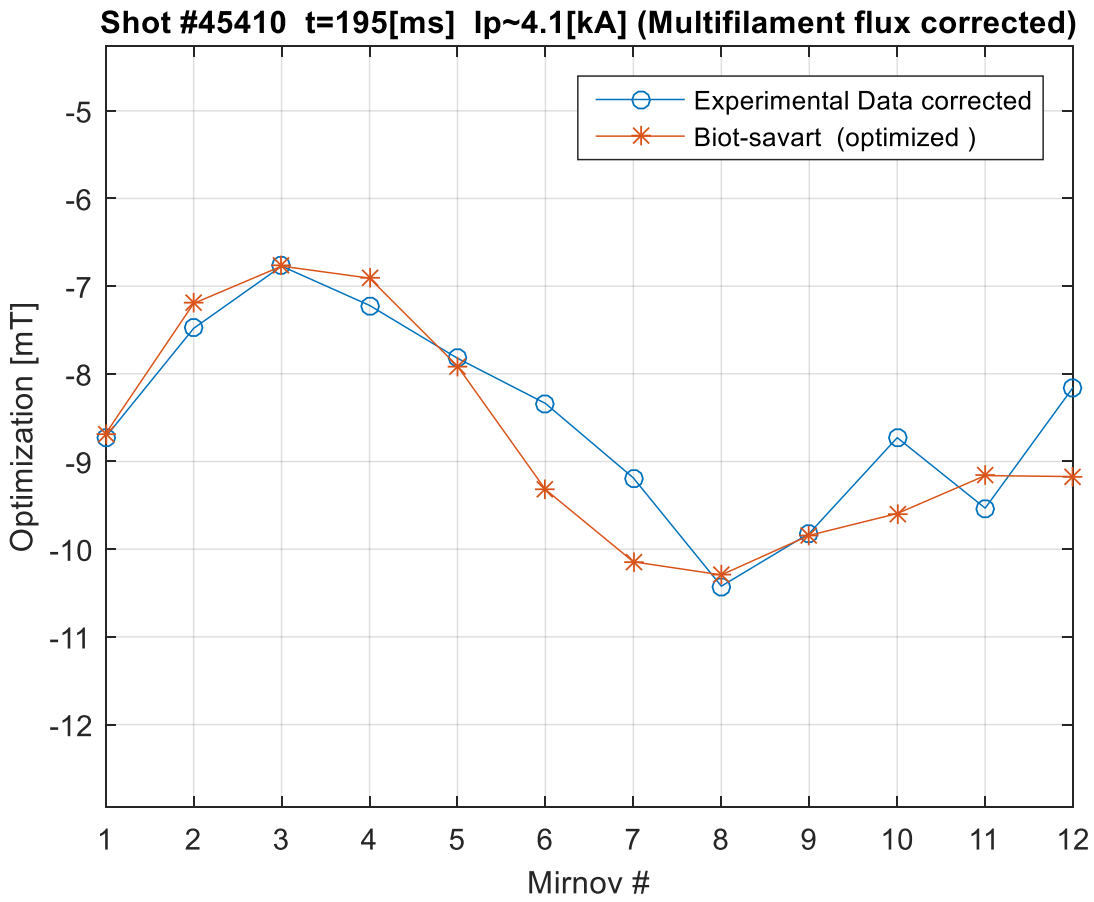
$$\sum_{i=1}^{12} \left| \tilde{B}_{mirnv} - B_{mirnv}\left(I_{filament}\right) \right| = \text{Error}$$

- Plasma current : Single wire in the center of the chamber





$RMSE = 0.0652[mT]$



$RMSE = 0.233[mT]$