

# Pattern Recognition Longitudinal Fitting with MINUIT

$$f_i = x_c + (x_0 - x_c) \sin\left(\frac{t_s \times z_i}{\rho}\right) - (y_0 - y_c) \times \cos\left(\frac{t_s \times z_i}{\rho}\right)$$

$$g_i = y_c + (y_0 - y_c) \sin\left(\frac{t_s \times z_i}{\rho}\right) + (x_0 - x_c) \times \cos\left(\frac{t_s \times z_i}{\rho}\right)$$

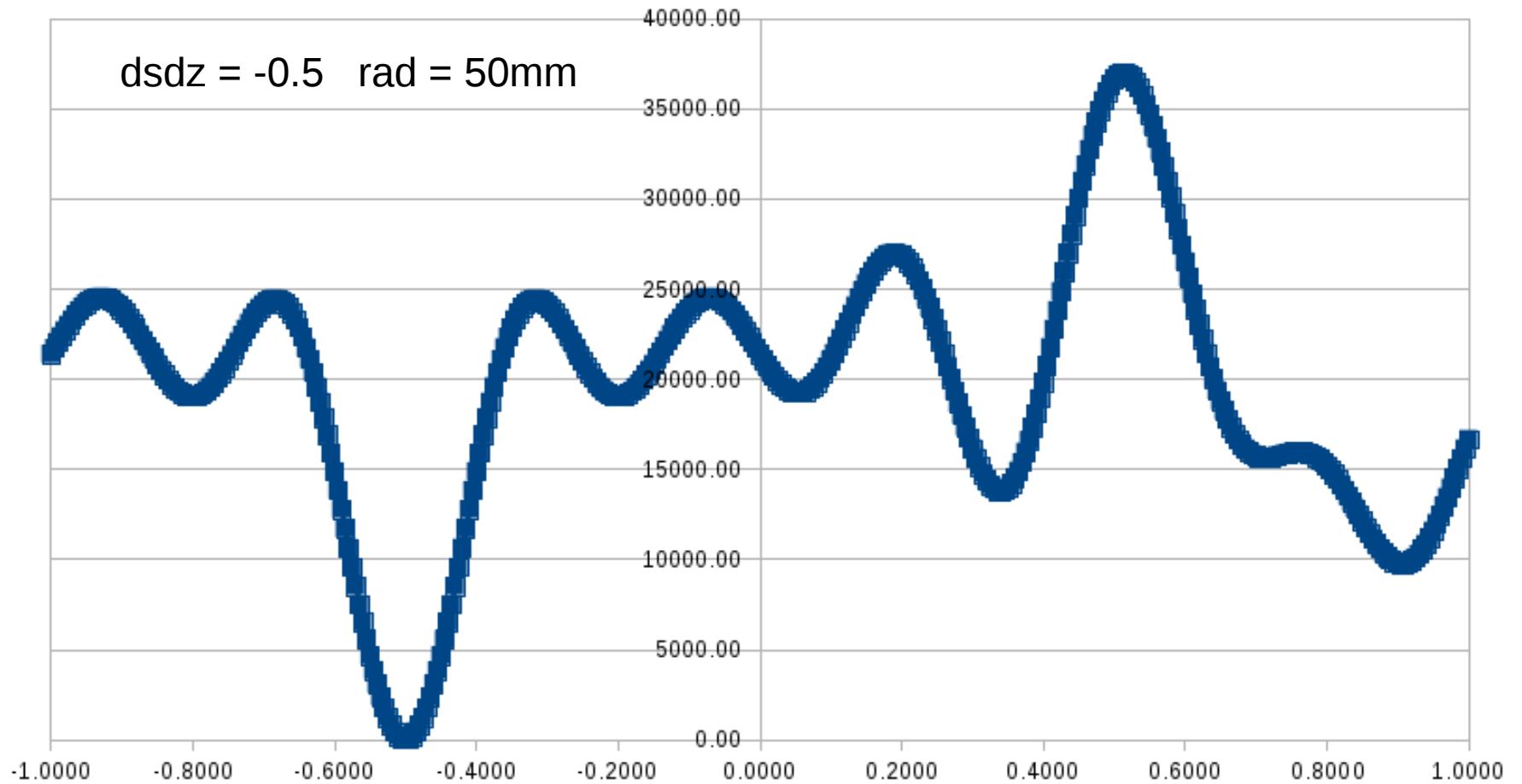
$$t_s = \frac{ds}{dz}$$

$$\delta x_i = f_i - x_i \quad \delta y_i = g_i - y_i \quad \delta \chi^2 = \delta x_i^2 + \delta y_i^2$$

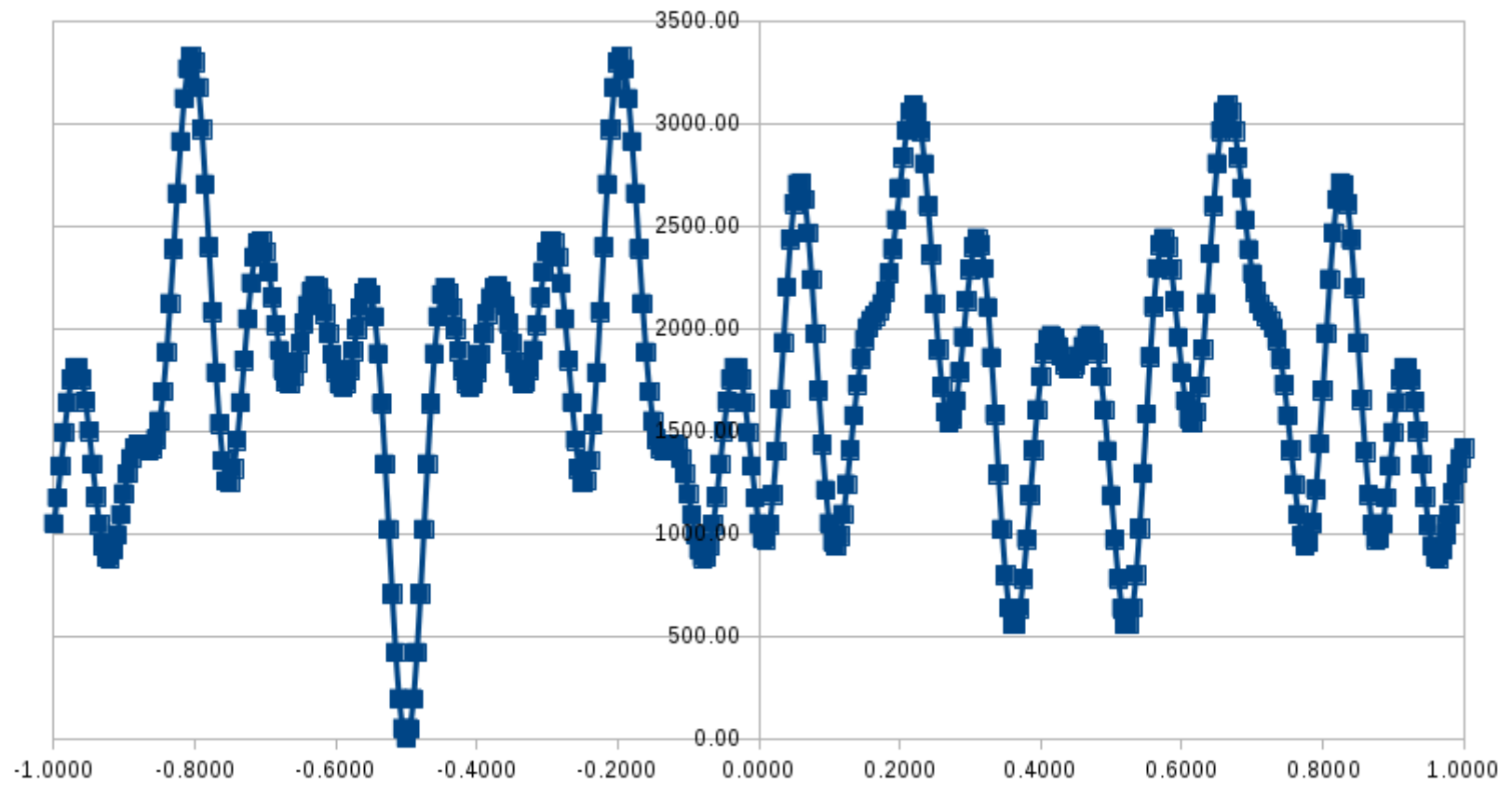
$$\chi^2 = \sum_{i=0}^4 \delta \chi_i^2$$

- Minimise wrt  $t_s$  to obtain correct  $t_s$

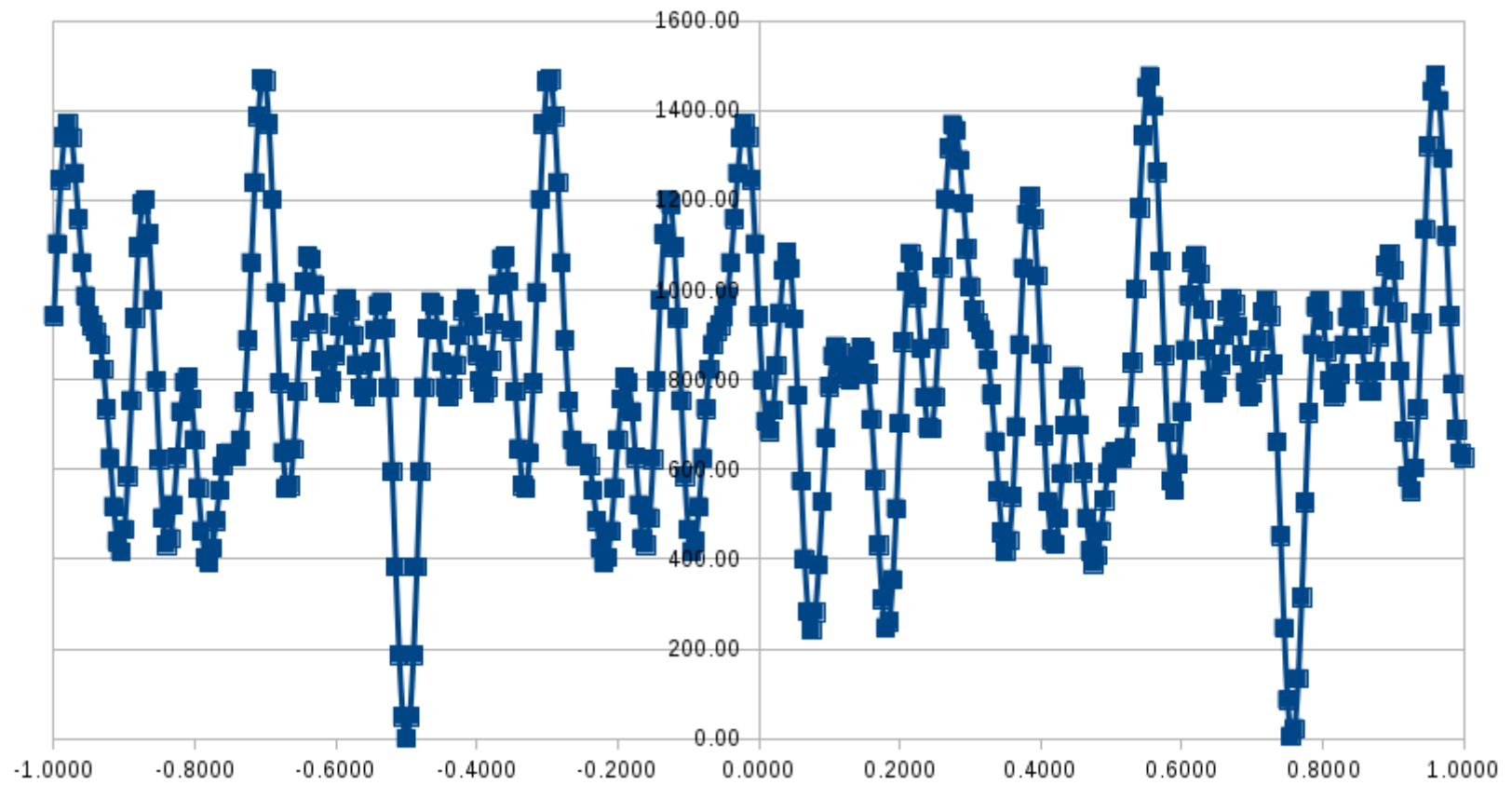
# ChiSq vs. dsdz



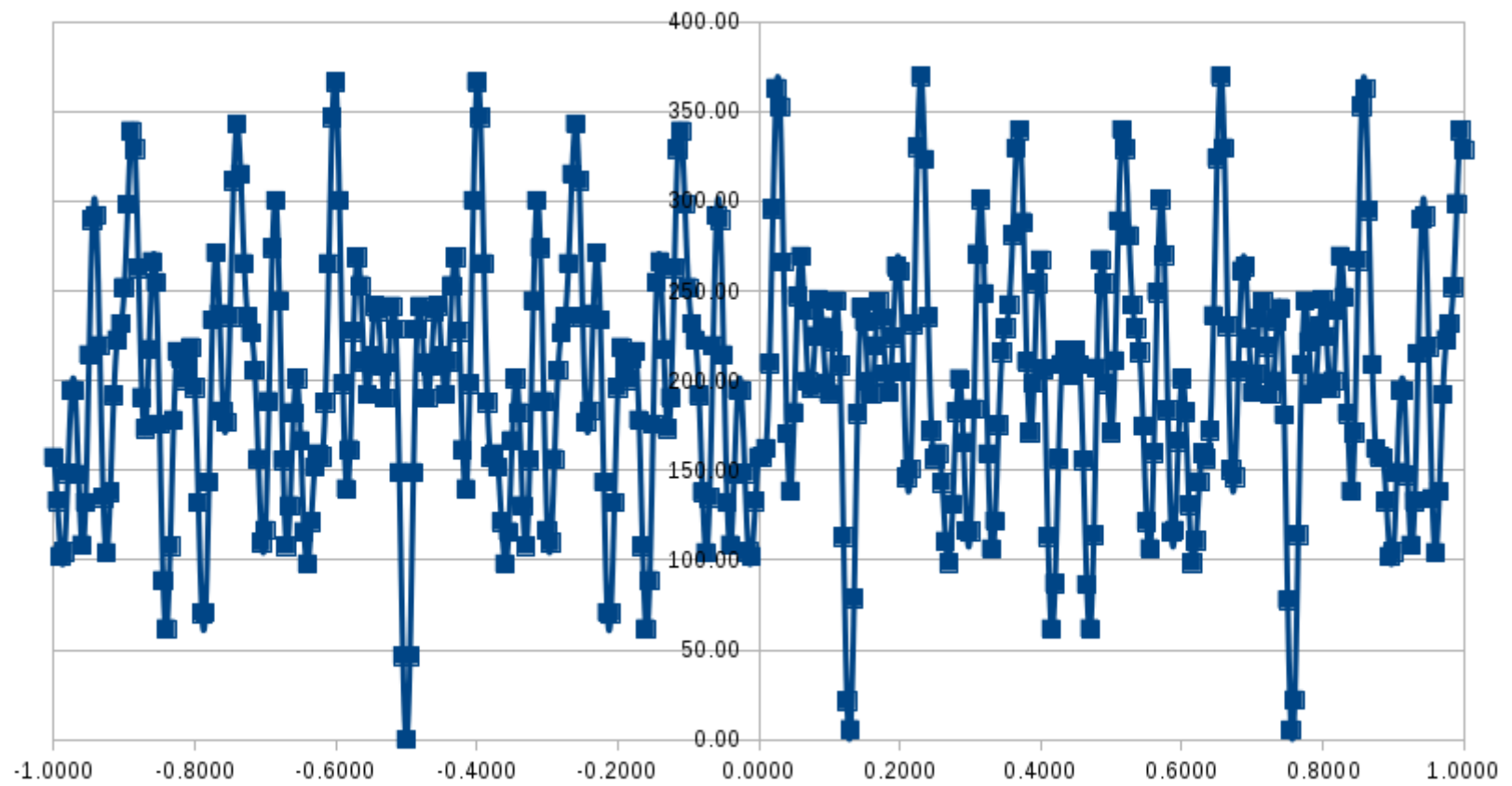
$d_{sdz} = -0.5$  rad = 15mm



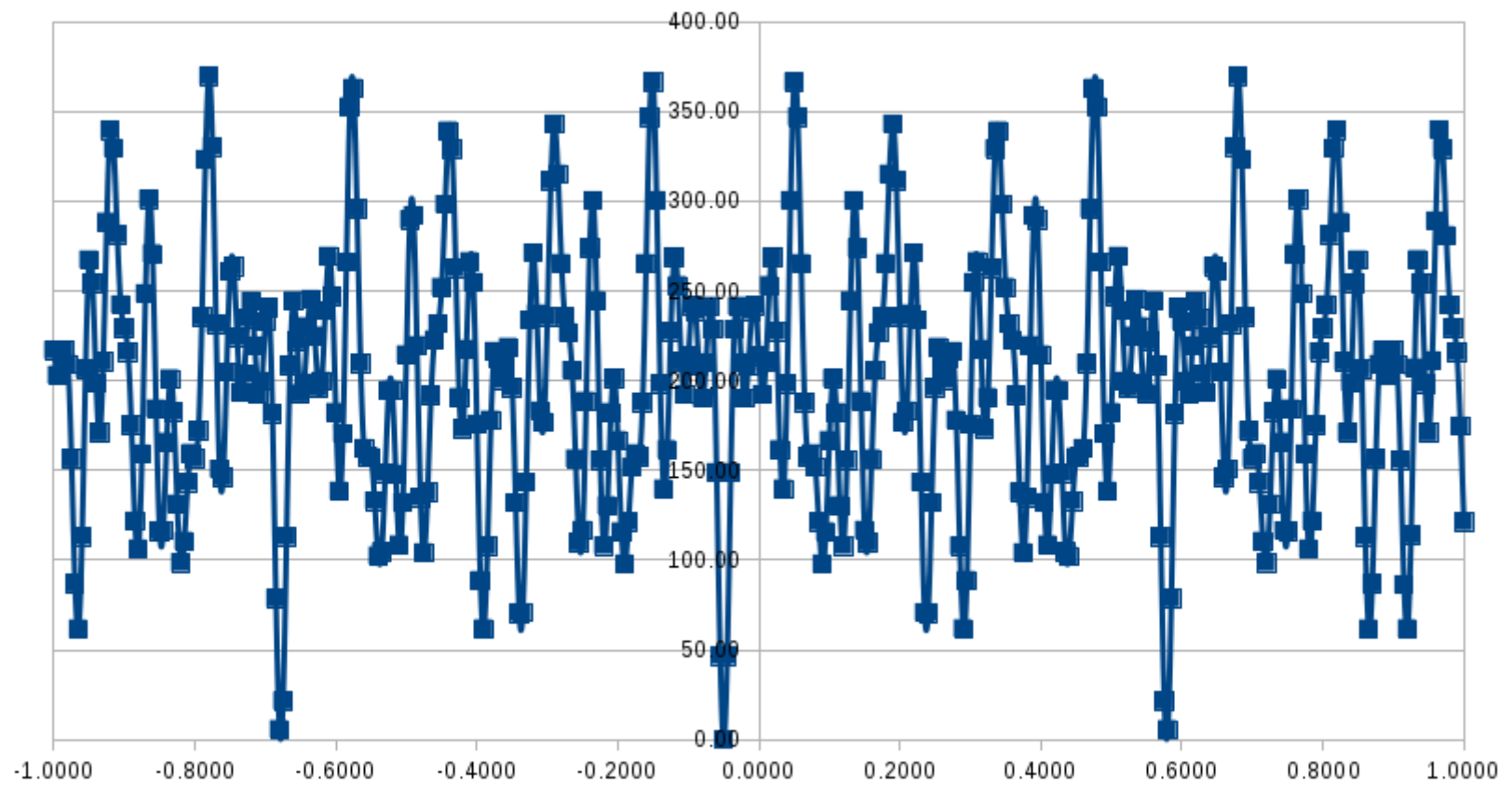
$d_{sdz} = -0.5$  rad = 10mm



$d_{sdz} = -0.5$  rad = 5mm



$d\text{sdz} = -0.05$  rad = 5mm



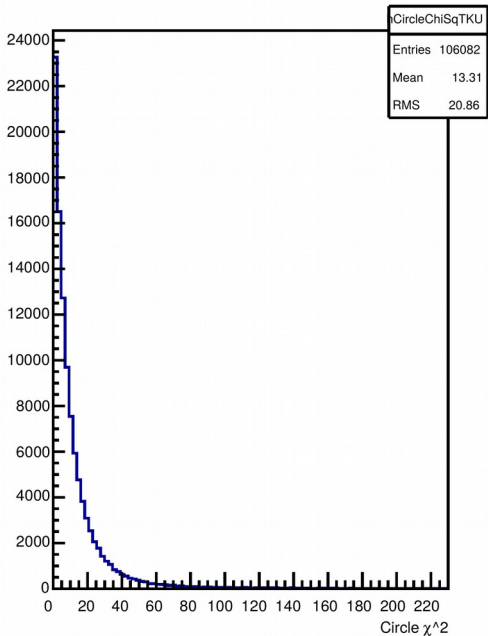
# Efficiency (Run 8681 Real Data)

Circle Fit	Chi2 Cut	Long Fit	Chi2 Cut	TU 5pt	TU 4-5pt	TD 5pt	TD 4-5pt
LSQ	5.0 / dof	LSQ	50 / dof	0.927	0.998	0.845	0.995
LSQ	5.0 / dof	MINUIT	30	0.504	0.909	0.366	0.839
LSQ	5.0 / dof	MINUIT	100	0.846	0.986	0.761	0.964
LSQ	5.0 / dof	MINUIT	500	0.959	0.998	0.932	0.992
LSQ	5.0 / dof	MINUIT	1000	0.975	0.999	0.953	0.996
MINUIT	100	MINUIT	1000	0.990	0.999	0.973	0.996

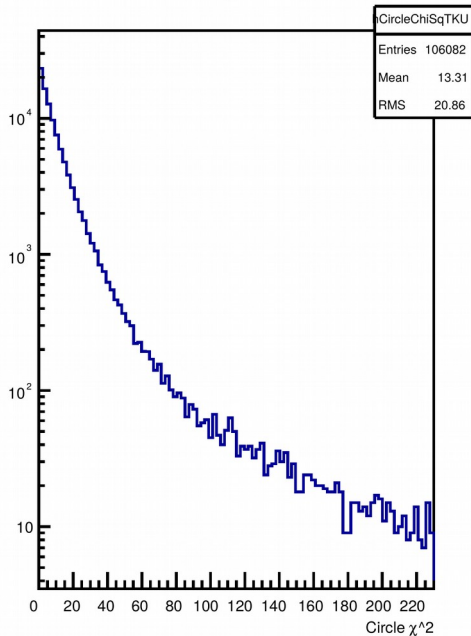
- Great efficiency results...
- Suspiciously large cuts needed for high efficiency
- Need to make MINUIT cuts on chi2 / dof
- Need purity analysis study...
- Need purity analysis code
- Need resolution study

# Chi2 for MINUIT Circle 100, MINUIT Longit 1000

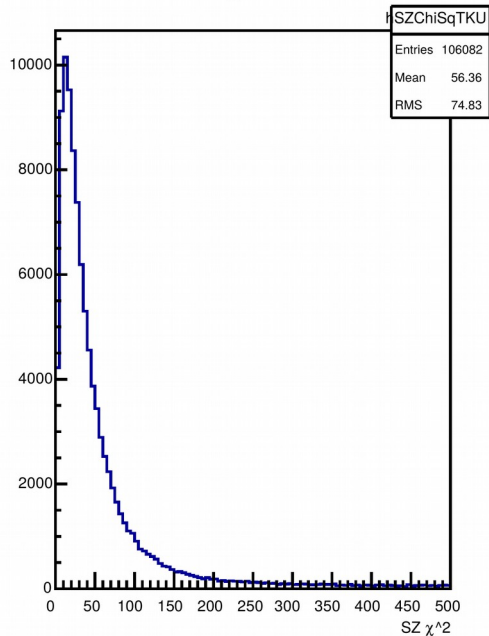
Circle  $\chi^2$  TkU



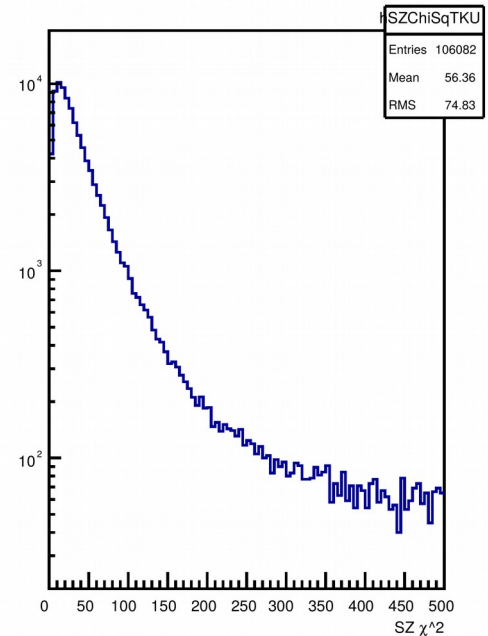
Circle  $\chi^2$  TkU



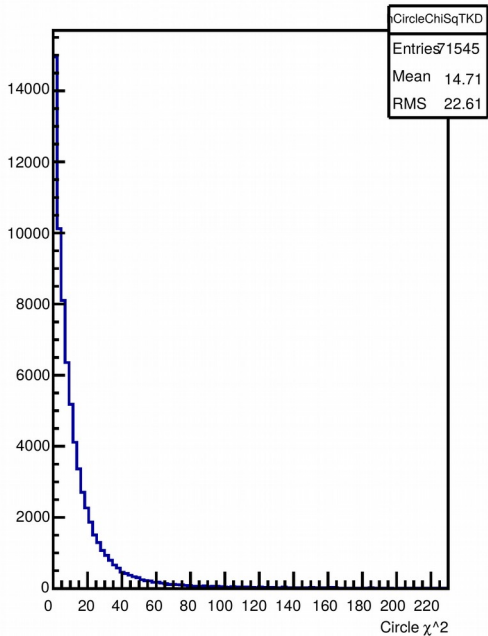
SZ  $\chi^2$  TkU



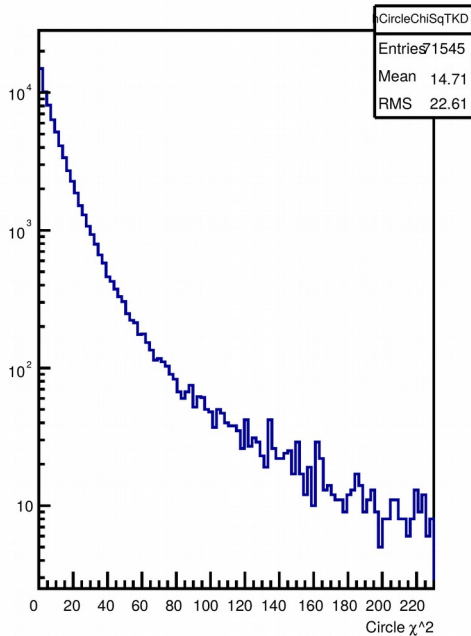
SZ  $\chi^2$  TkU



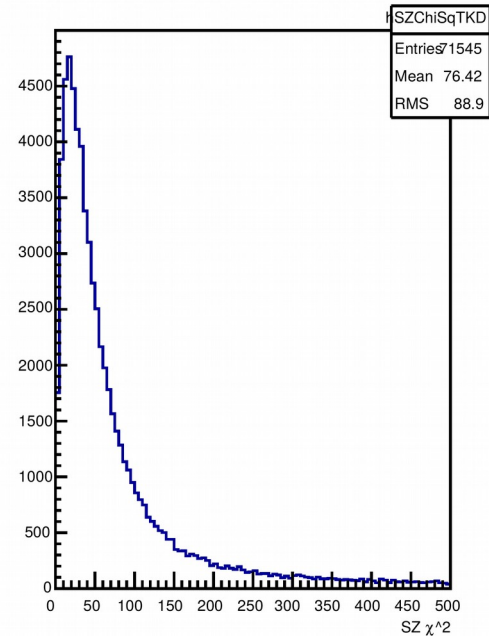
Circle  $\chi^2$  TkD



Circle  $\chi^2$  TkD



SZ  $\chi^2$  TkD



SZ  $\chi^2$  TkD

