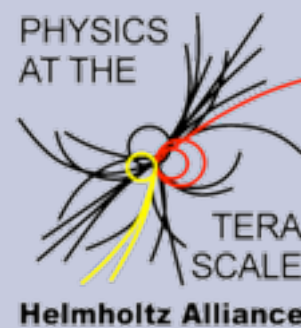




MPII - 'pair entries' cut or 180k parameters in 20min

C. Kleinwort

DESY/HH alignment meeting 31.03.10

Global Matrix

- ★ Sparse storage

- ▶ Only the non zero off-diagonal elements are stored
 - ✦ Sparsity 10%, 8GB: ~ 120k parameters

- ★ New cut ‘pairentries n_{cut} [n_{his}]’

- ▶ Neglect parameter pairs (off-diagonal elements) with less than n_{cut} entries
 - ✦ Sparsity 1%, 8GB: ~ 380k parameters
- ▶ Count entries in minimal bit field
 - ✦ Example: $n_{\text{cut}} = 5$ needs 3 bits, 200k parameters require $3 \cdot (200\text{k})^2 / 2 = 60 \text{ Gbits} = 7.5 \text{ GB}$

Barrel cosmics, 200k tracks

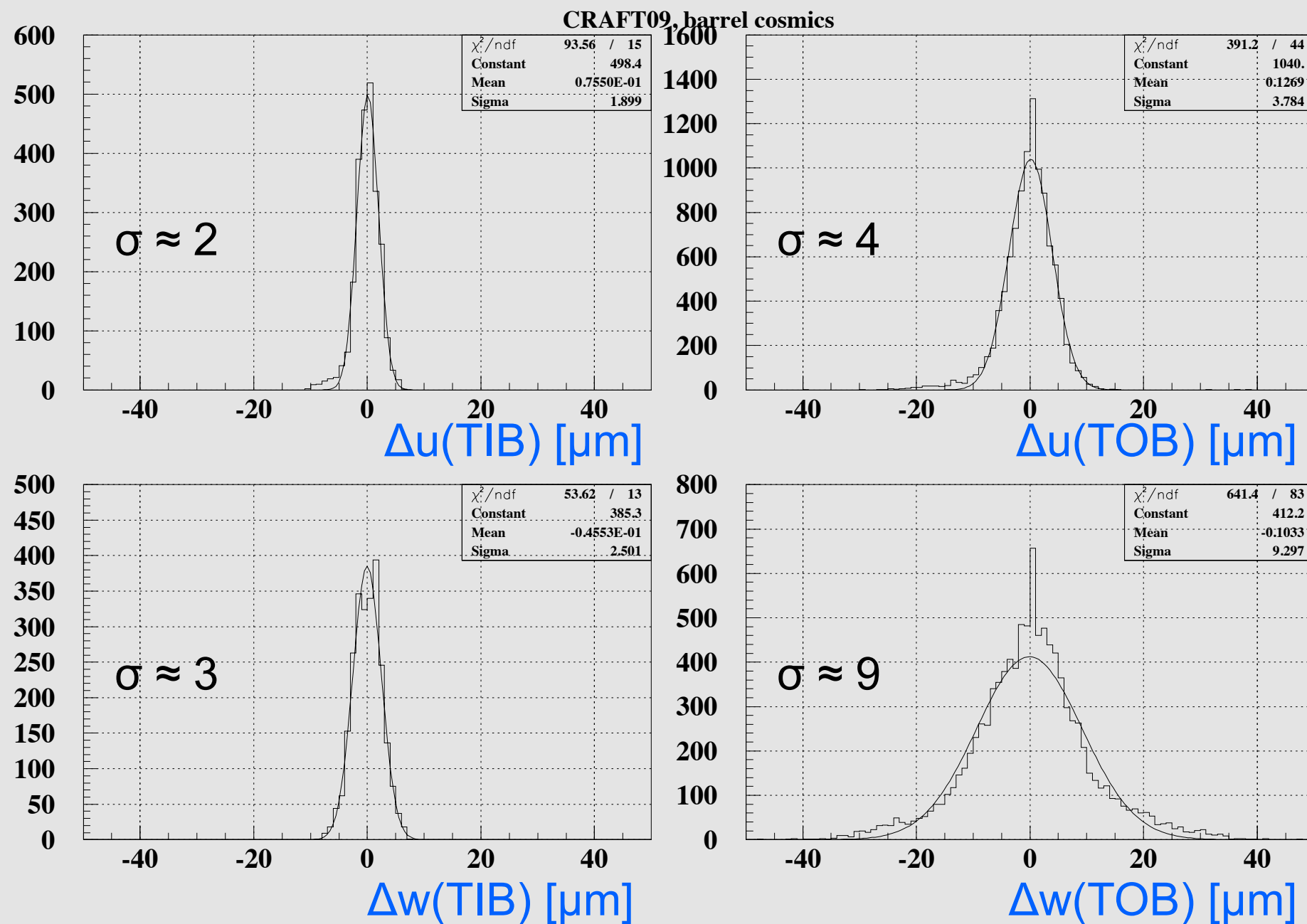
Linear terms fixed, 66k variable parameters

entries	pair entries	bit field width	bit array [GB]	off-diag. elem. [M]	matrix [GB]	cpu time [min]	χ^2	rejects
50	1	1	0.27	380	4.6	60	1987978	3159
50	2	2	0.54	152	1.9	18	1988128	3157
50	4	3	0.81	46	0.57	9	1988517	3155
50	10	4	1.08	11	0.15	7	1989313	3144

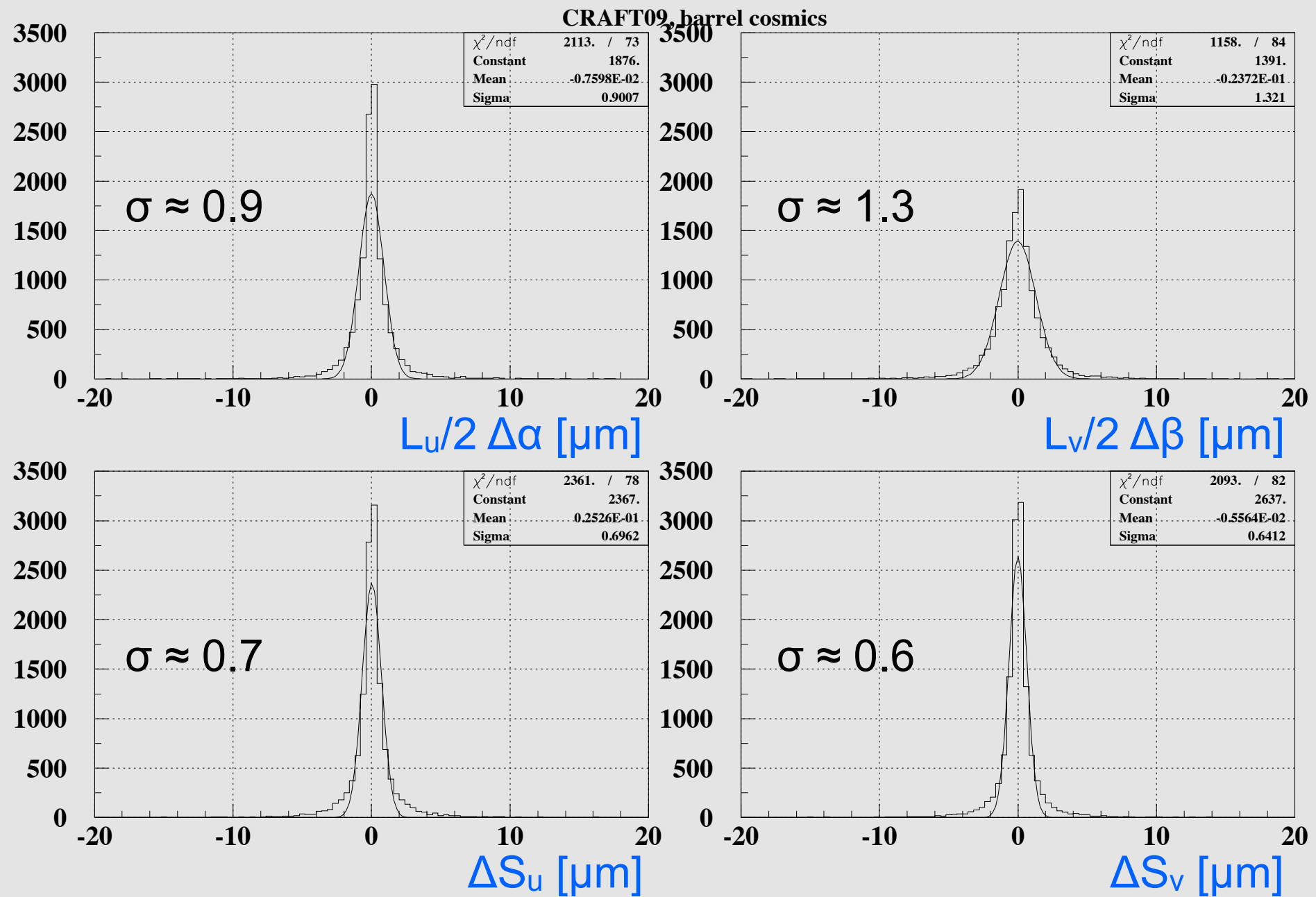
All terms, 103k variable parameters

entries	pair entries	bit field width	bit array [GB]	off-diag. elem. [M]	matrix [GB]	cpu time [min]	χ^2	rejects
50	1	1	0.67	956	>8			
50	2	2	1.34	387	4.7	100	1951380	2756
50	4	3	2.01	117	1.4	37	1951668	2757
50	10	4	2.67	29	0.37	17	1952331	2778

Results, pair ent. cut 2 vs 10



Results, pair ent. cut 2 vs 10



Cosmics, 260k tracks

150k variable parameters

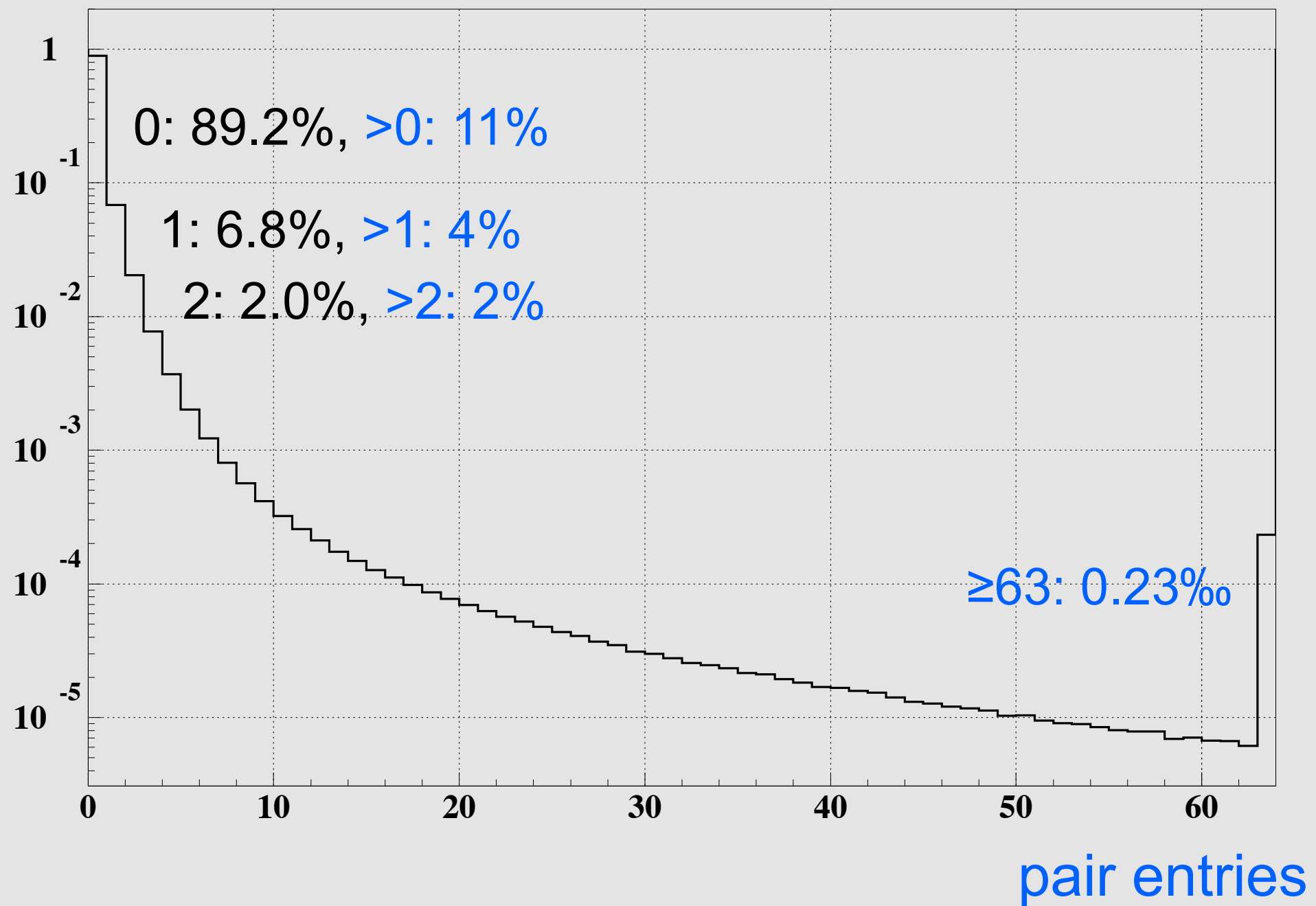
entries	pair entries	bit field width	bit array [GB]	off-diag. elem. [M]	matrix [GB]	cpu time [min]	χ^2	rejects
50	1	1	1.4	1223	>8			
50	2	2	2.8	449	5.4	100	2485804	4386
50	4	3	4.2	130	1.6	31	2485924	4384
50	10	4	5.7	32	0.4	16	2487019	4398

180k variable parameters

entries	pair entries	bit field width	bit array [GB]	off-diag. elem. [M]	matrix [GB]	cpu time [min]	χ^2	rejects
25	1	1	2.0	1312	>8			
25	2	2	4.0	463	5.6	111	2418078	3770
25	4	3	6.0	132	1.6	37	2413875	3584
25	10	4	8.0	32	0.4	19	2415664	3659

Cosmics, 260k tracks

fraction



Summary

★ Cut on 'pair entries'

- ▶ Neglect rare parameter pairs (off-diag. elements)
- ▶ Matrix size largely reduced!
 - ♦ 200k barrel cosmics, pair entries cut 2 vs 10:
 - Number of off-diagonal elements reduced by factor ~ 13
- ▶ Results slightly changed?
 - ♦ 200k barrel cosmics, pair entries cut 2 vs 10:
 - RMS for offsets several (2-9) μm
 - RMS for steps, sagittas $\sim 1 \mu\text{m}$

★ Be careful (as always)