

Position calibration with Jpp

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Introduction (1/3)

A. Event building

- JAcousticEventBuilder[.sh]
 - 20 seconds / run

B. Global fit

- JKatoomba[.sh]
 - 5 seconds / run (see Computing and Software e-log [449](#))

Introduction (2/3)

- Fit parameters
 - JModel
 - t_a^n time-of-emission of emitter a and ping n
 - T_x^i slope (dx/dz) of string i
 - T_y^i slope (dy/dz) of string i
- Hit
 - JHit<JPDFGauss>
 - t_i measured time-of-arrival of receiver i
 - σ $50 \mu s$
 - p_{bg} 0

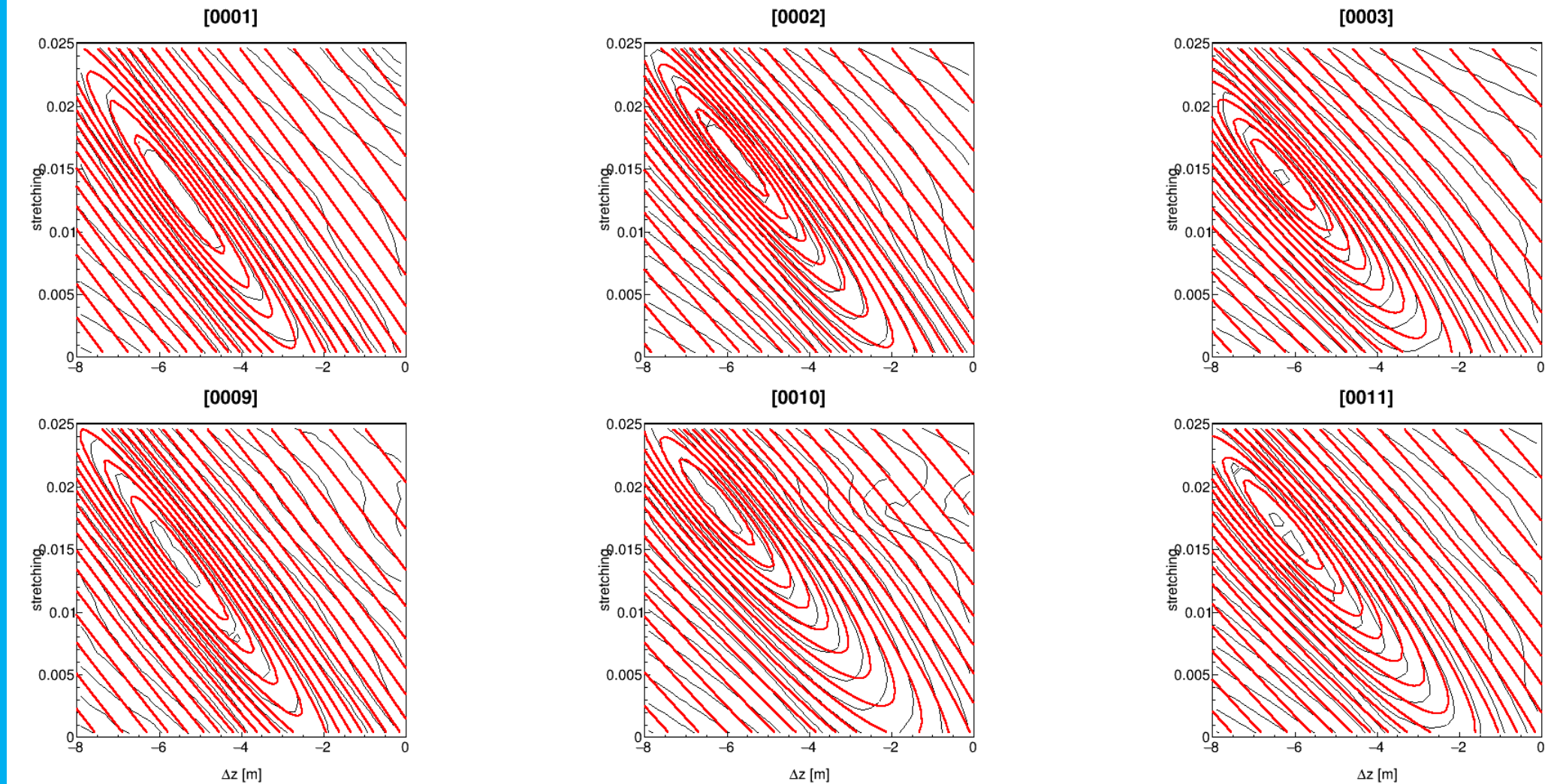
Introduction (3/3)

- Fixed parameters
 - (x, y, z) position of each emitter
 - (x, y, z) position of reference point of each string (top of T-bar)
 - (x, y, z) position of hydrophone relative to reference point of string
 - (effective) height of each receiver (bottom of glass sphere)
 - sound velocity (and depth dependence thereof)
- Possible tuning of fixed parameters
 1. scan of values
 2. repeated fits of model to data covering an extended data taking period
 3. minimisation of average χ^2 / NDF of fits

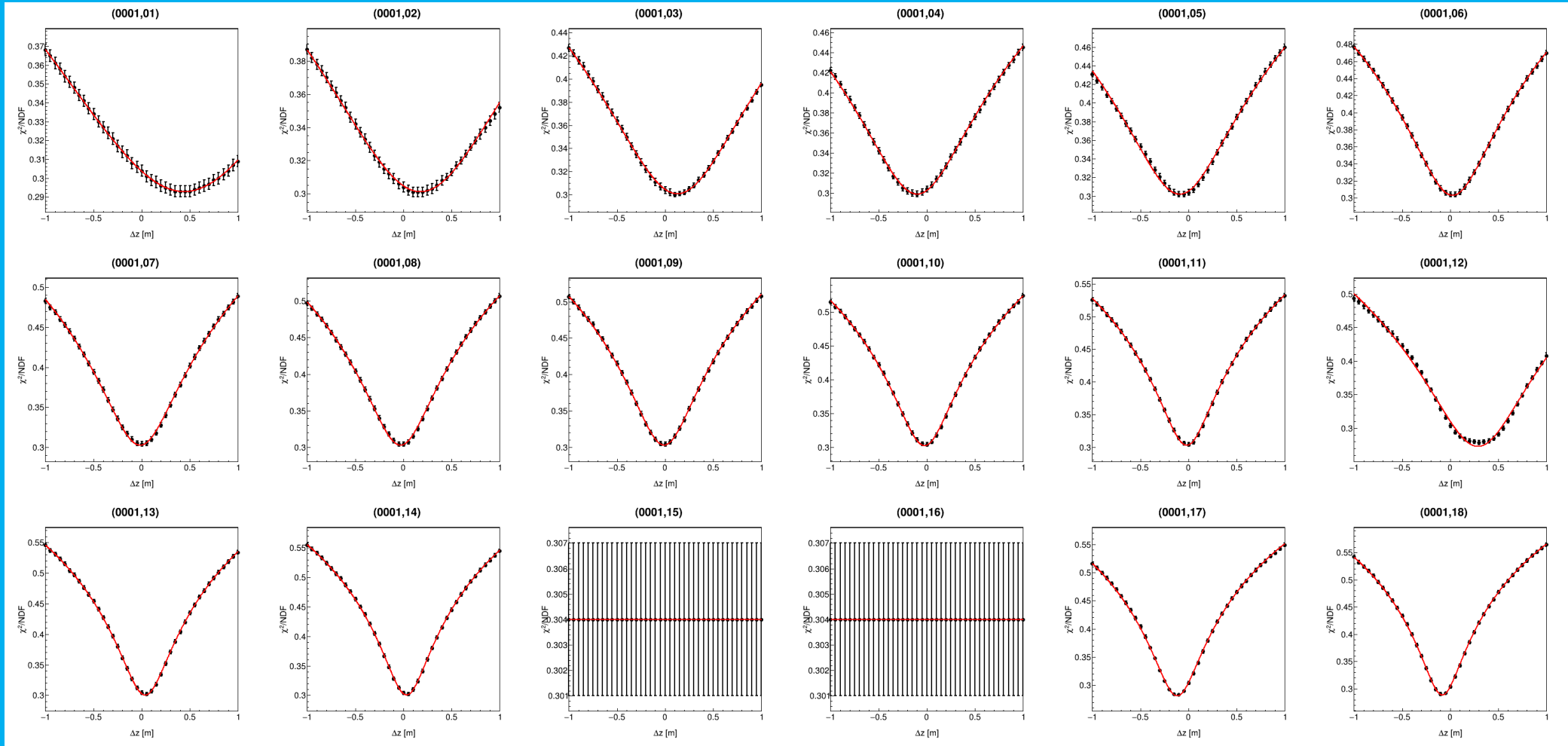
Tuning of fixed parameters

- suite of scripts available at <http://www.jpp.com.au/examples/JAcoustics/>
 - detector-Zmul:(run | plot | fit).sh # stretching of string
 - module-Z:(run | plot | fit).sh # (z) position of modules in string
 - tripod-3Z:(run | fit).sh # (z) position of 3 tripods
 - detector-XY:(run | plot | fit).sh # (x, y) position of string
- data
 - ORCA detector 49; runs 7600, 7700, 7800, 7900, 8000, 8100 and 8200

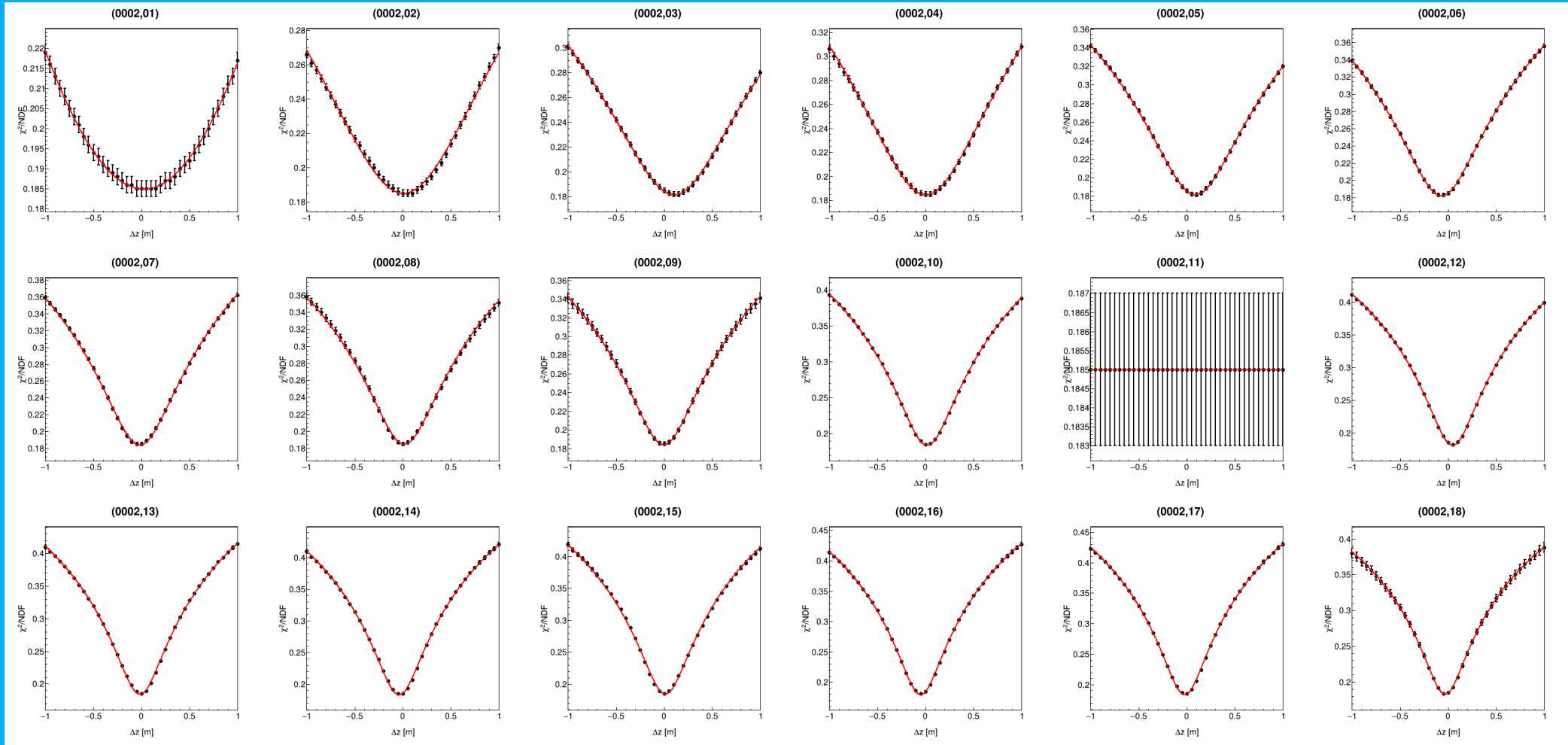
Stretching of string



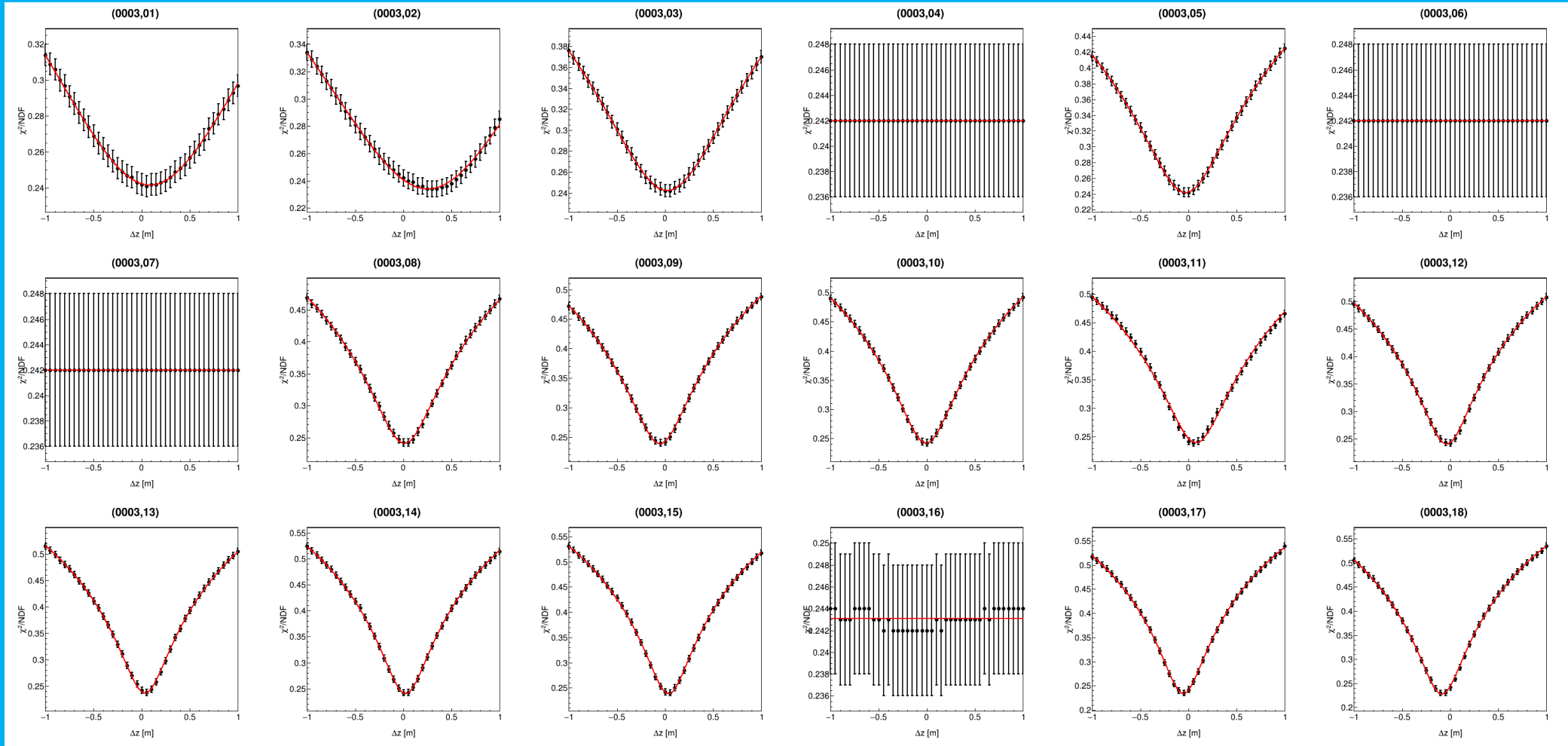
(z) positions of modules (1)



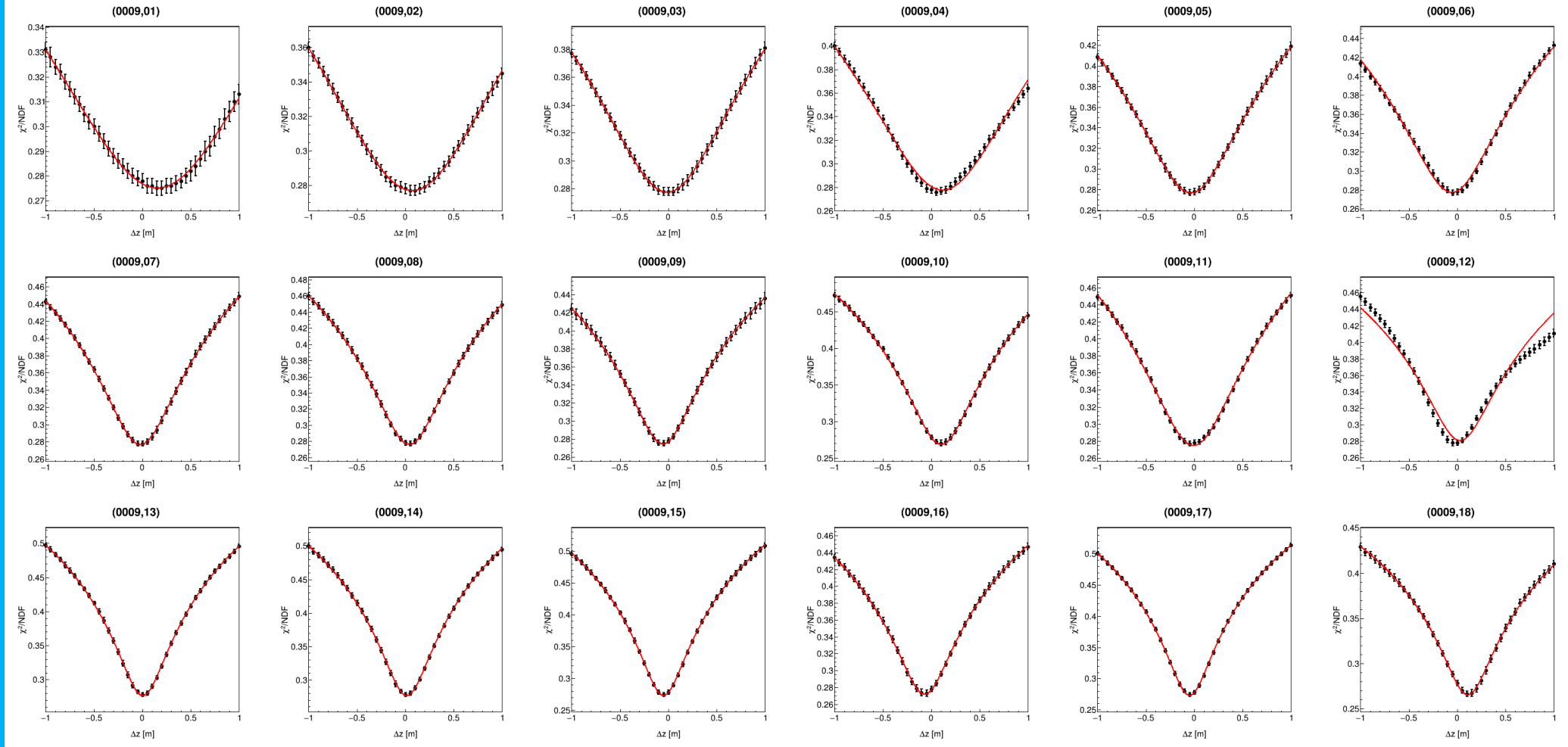
(z) positions of modules (2)



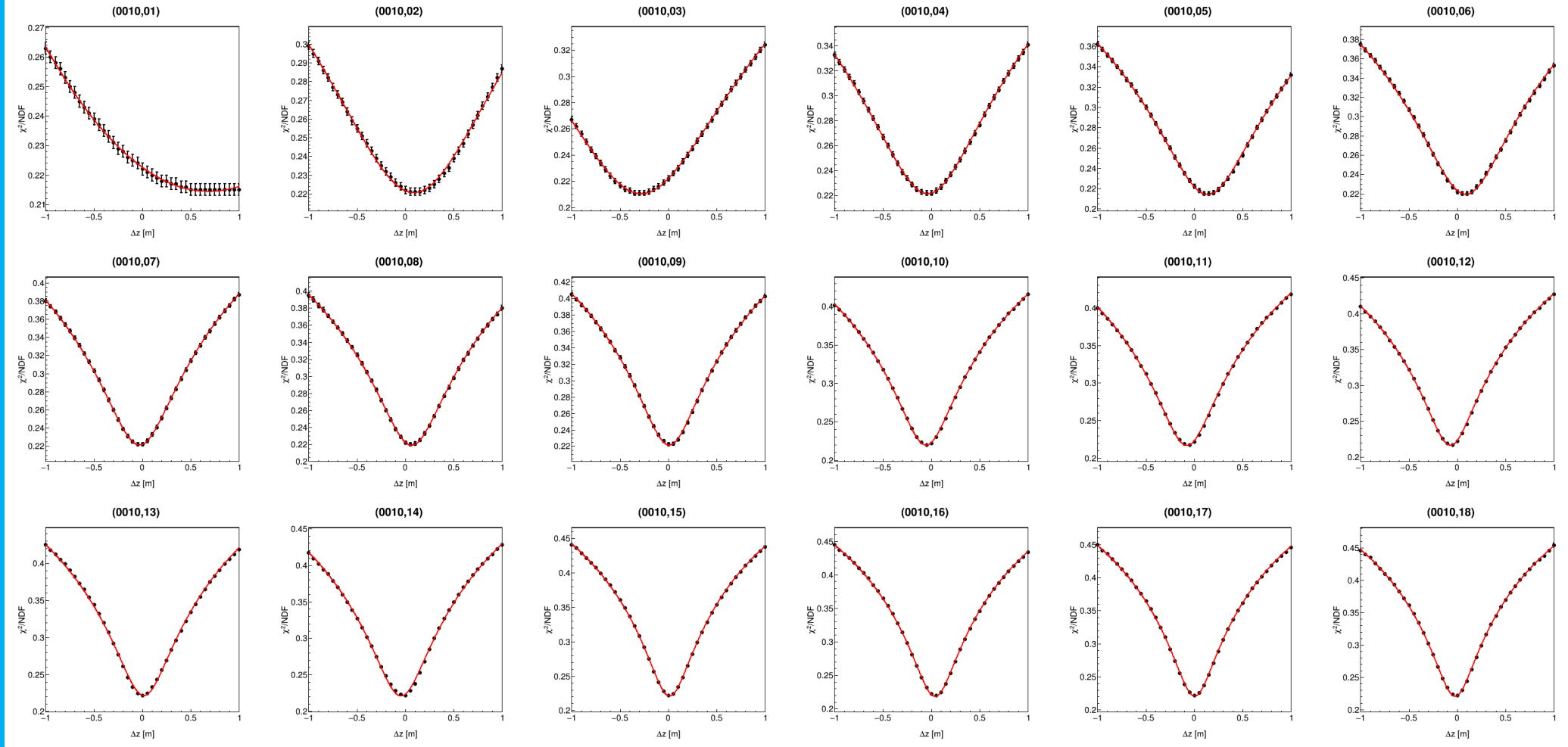
(z) positions of modules (3)



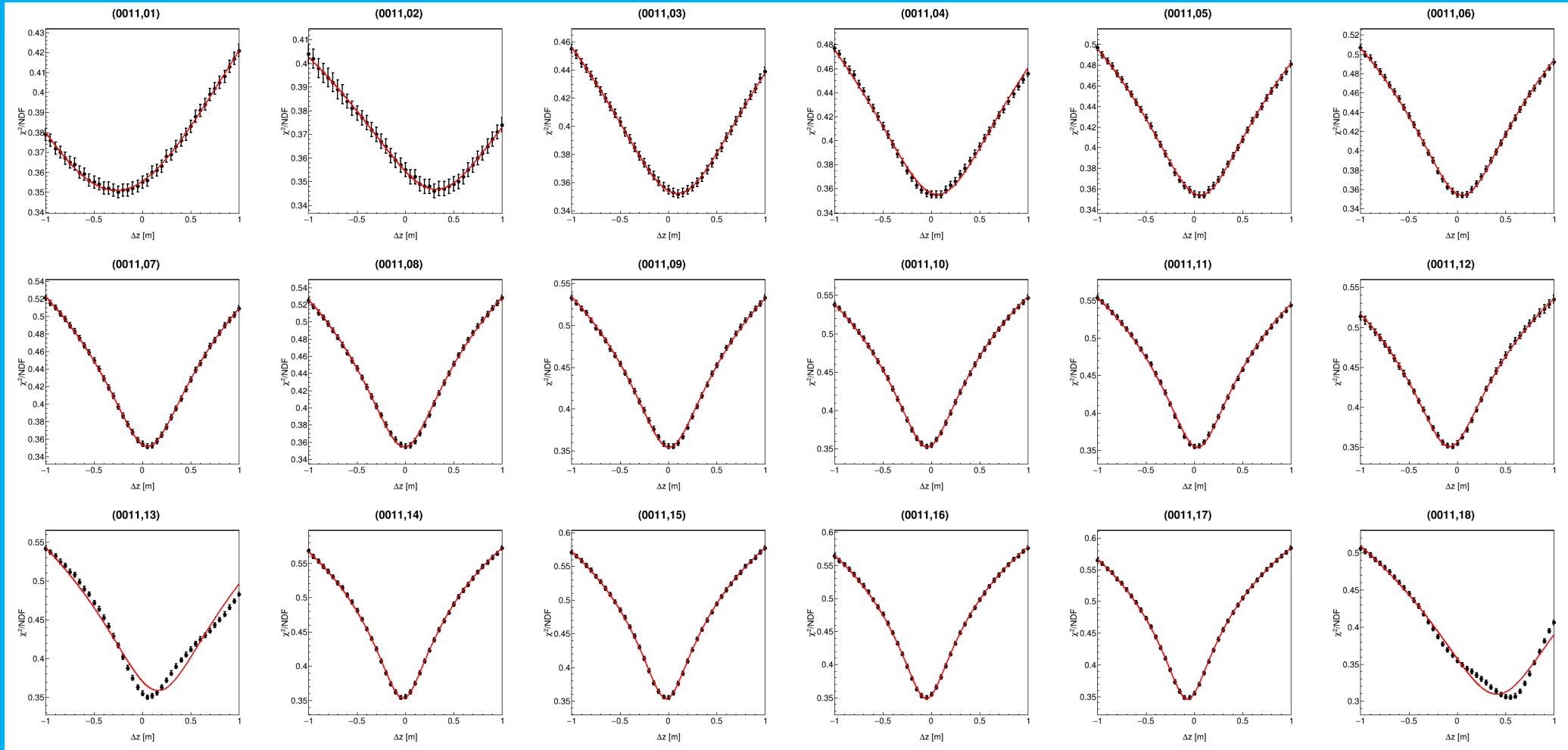
(z) positions of modules (9)



(z) positions of modules (10)

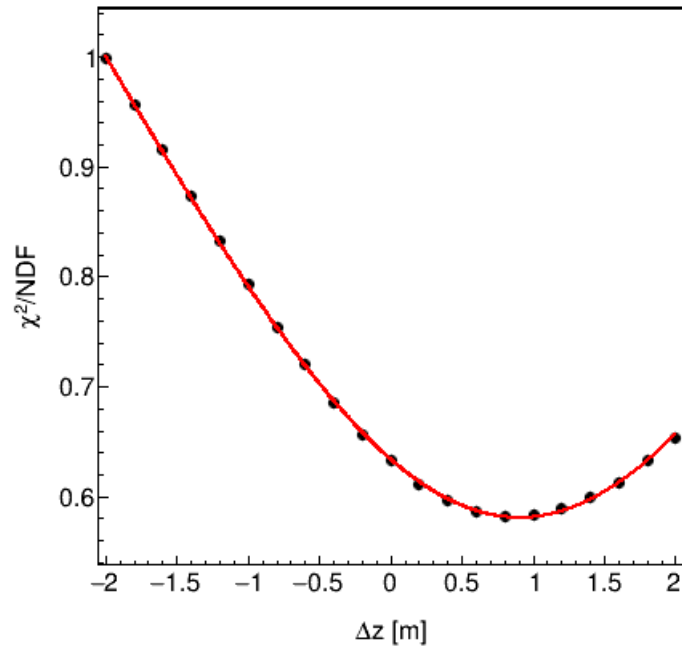


(z) positions of modules (11)

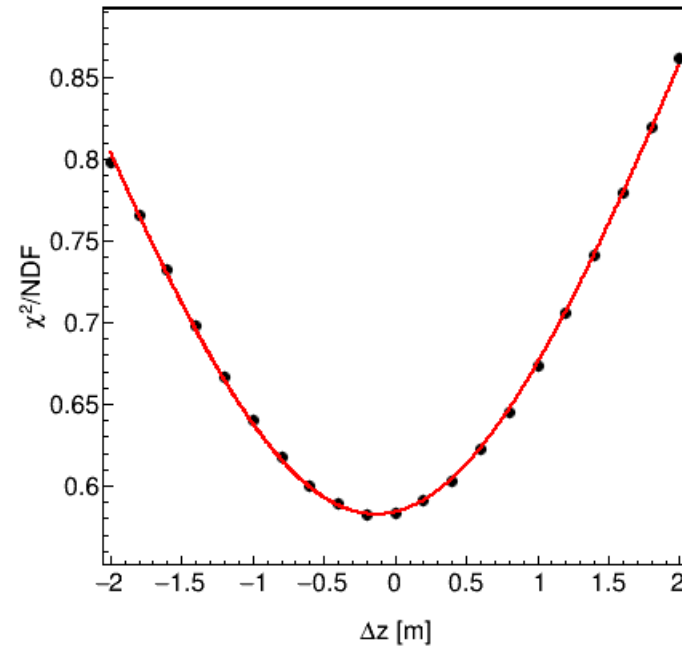


(z) positions of tripods

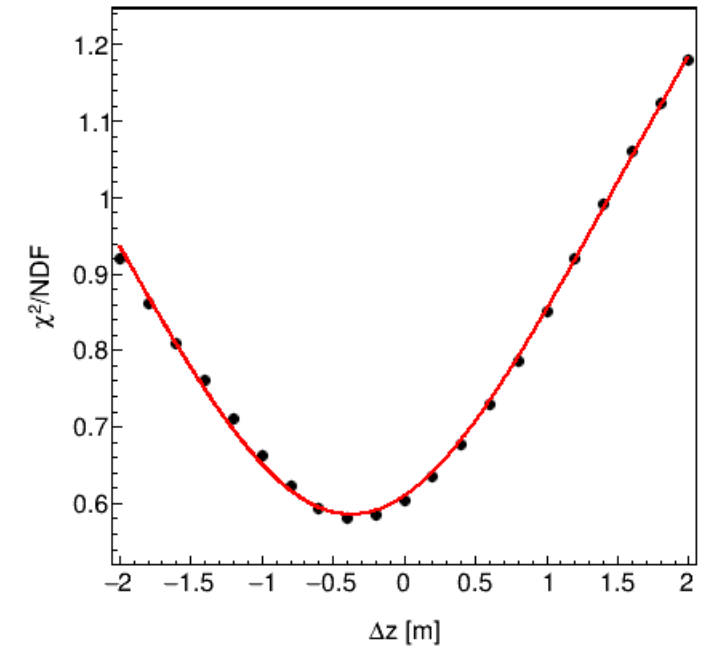
[12]



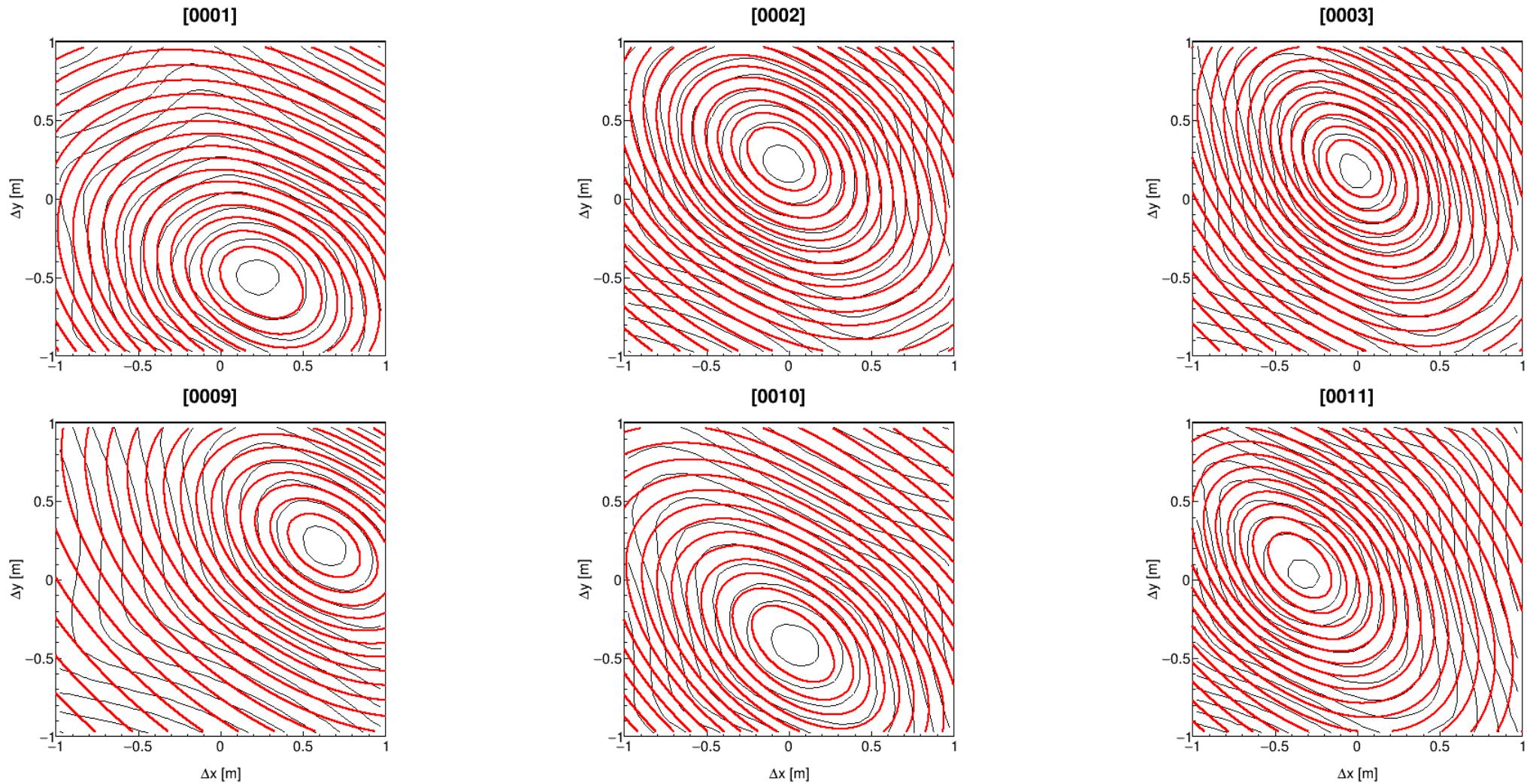
[14]



[16]



(x, y) positions of strings

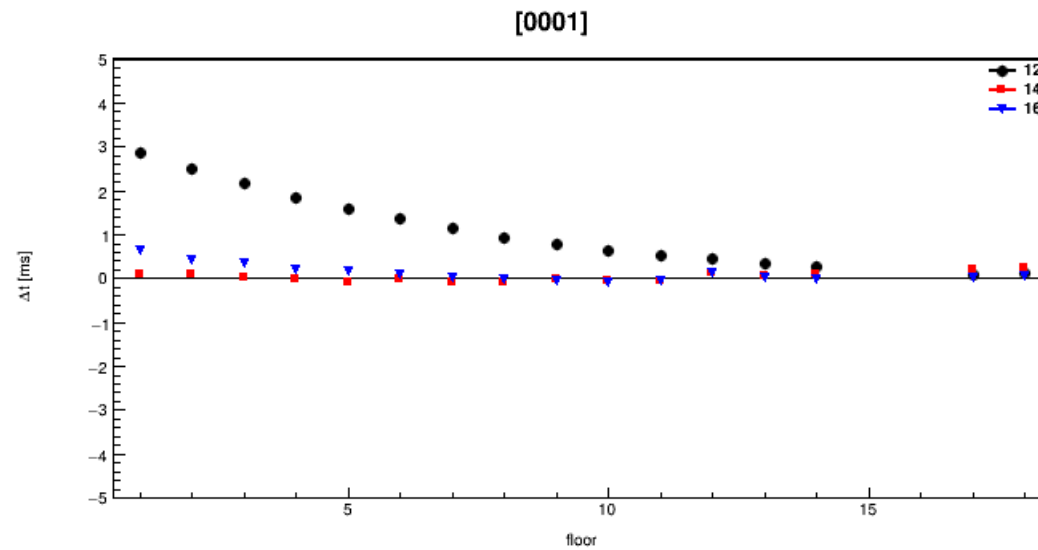


Test of position calibration

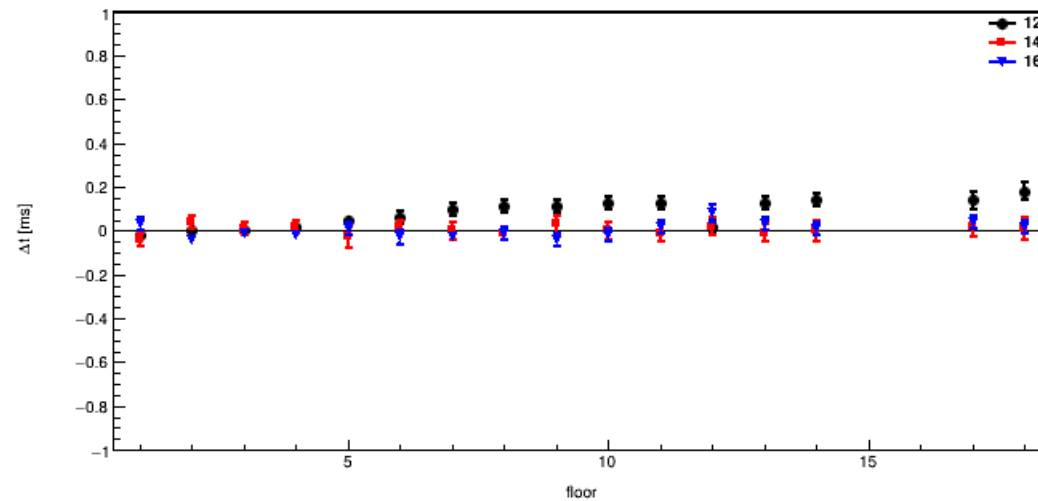
- Use result of tuning of fixed parameters
 - updated detector file
 - updated tripod file
- Apply position calibration
 - event building
 - model fit
- Monitor difference between measured and expected time-of-arrival
 - time residuals as a function of string, floor and tripod
- Compare time residuals
 - “before” and “after” tuning of fixed parameters

Position calibration (1)

before

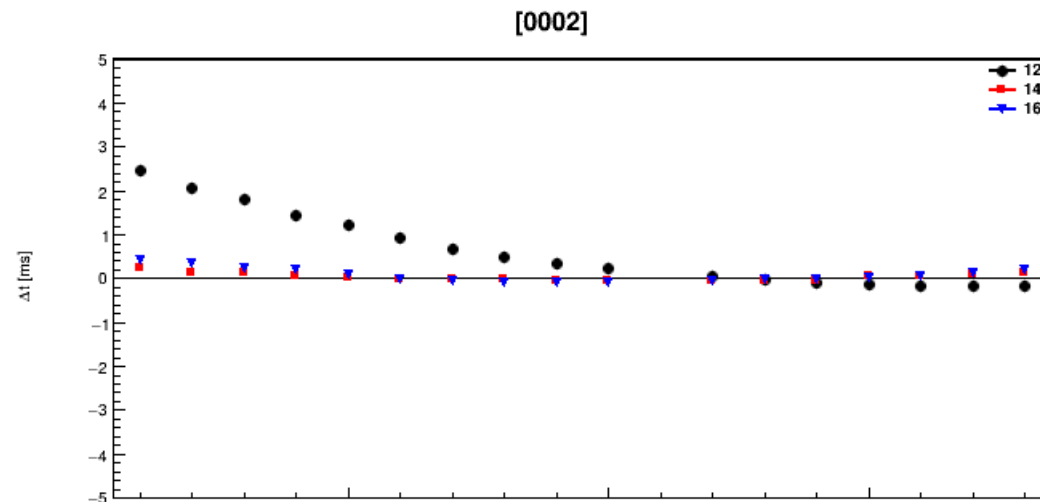


after

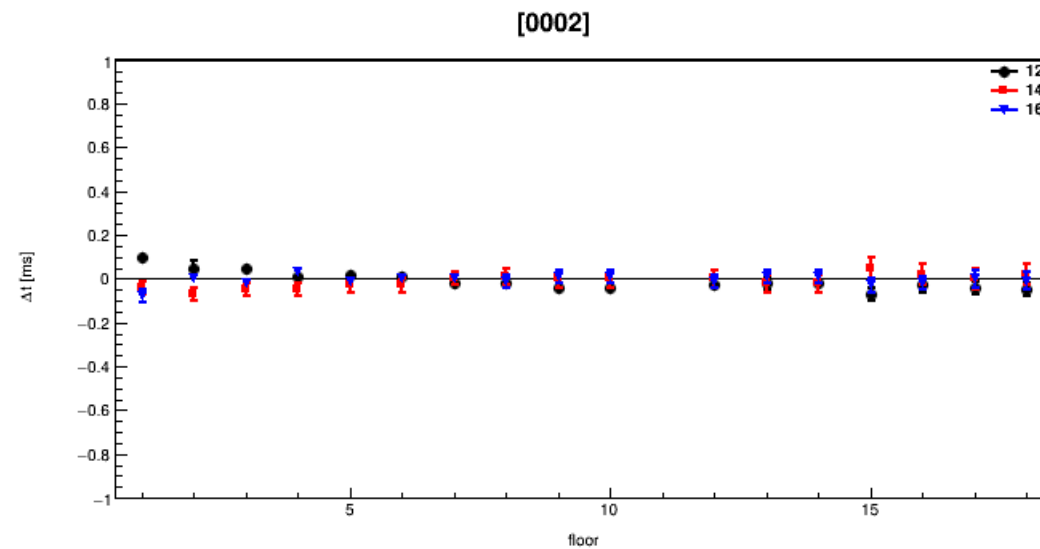


Position calibration (2)

before

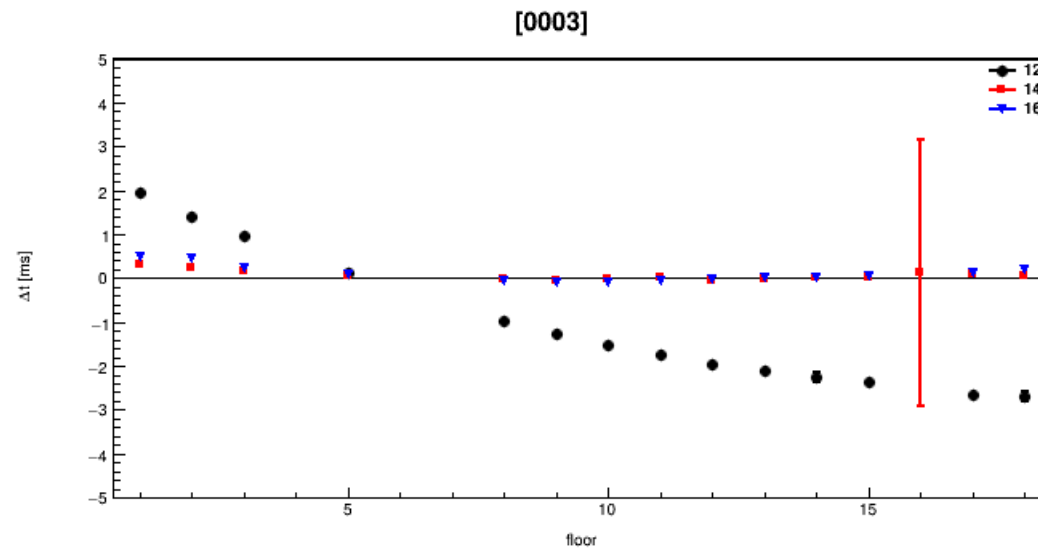


after

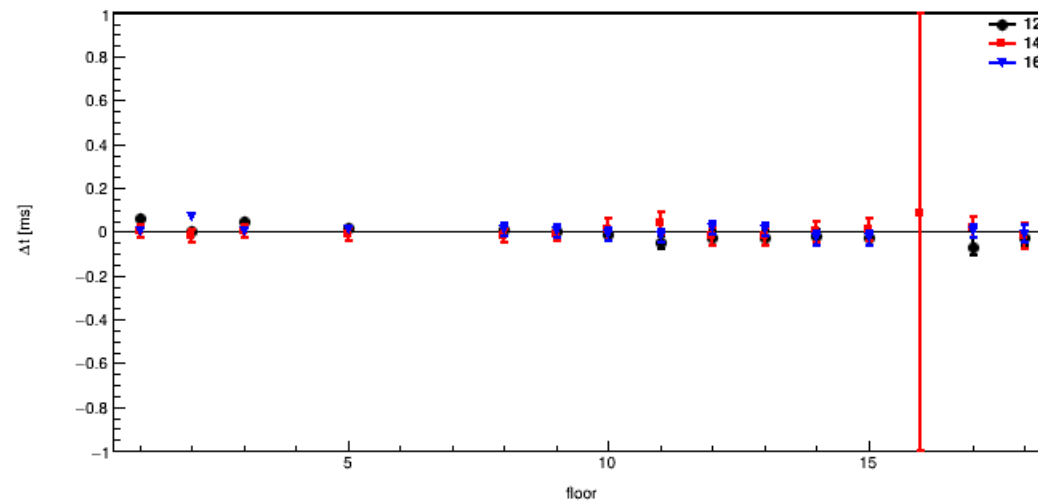


Position calibration (3)

before

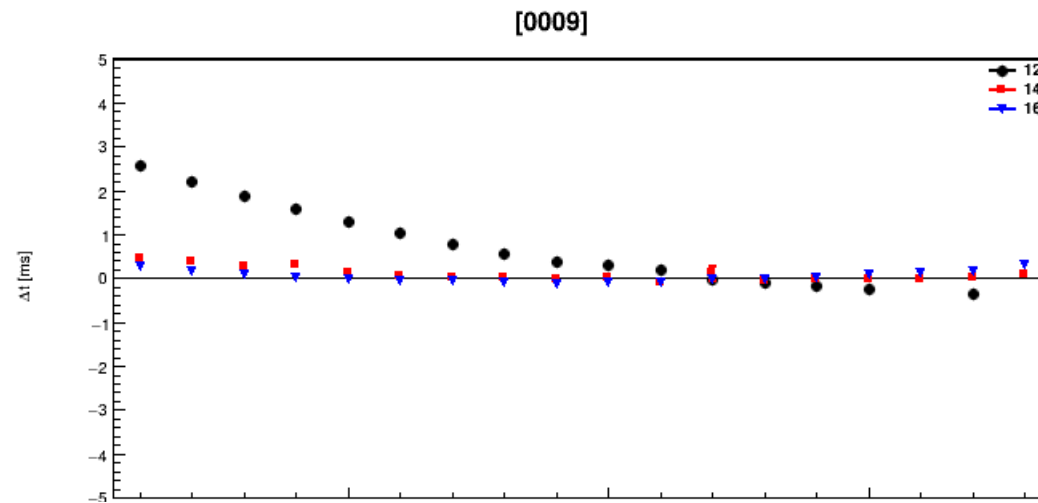


after

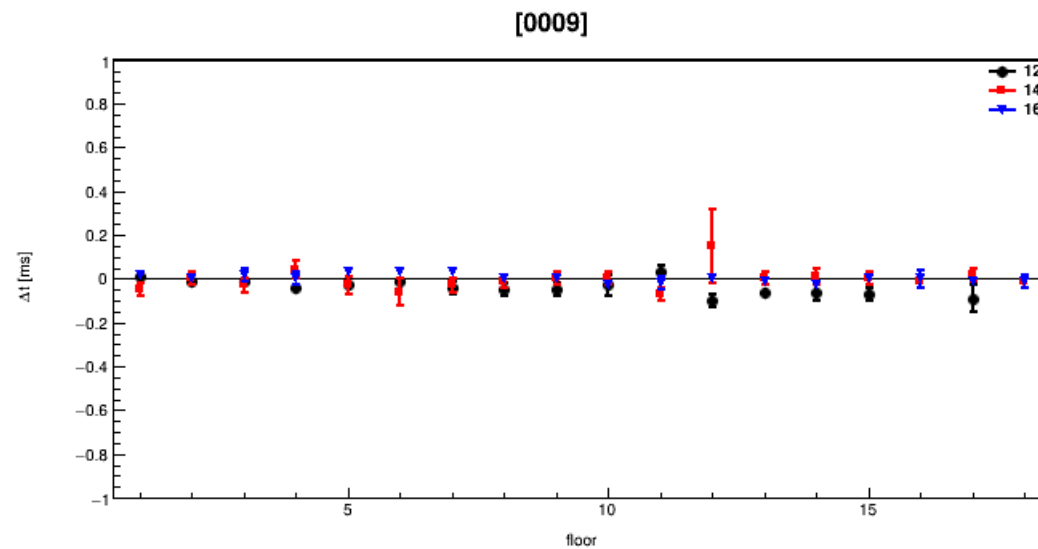


Position calibration (9)

before

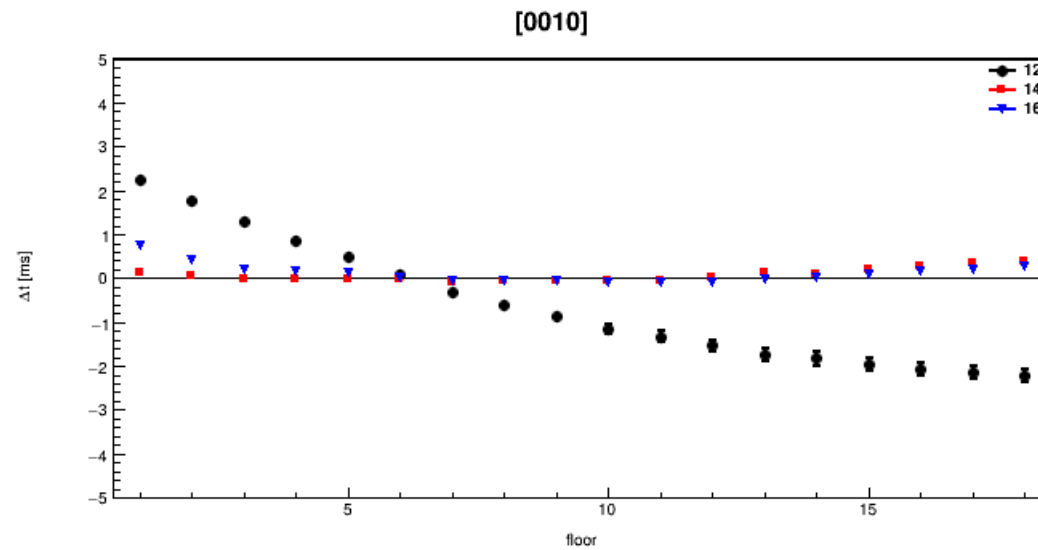


after

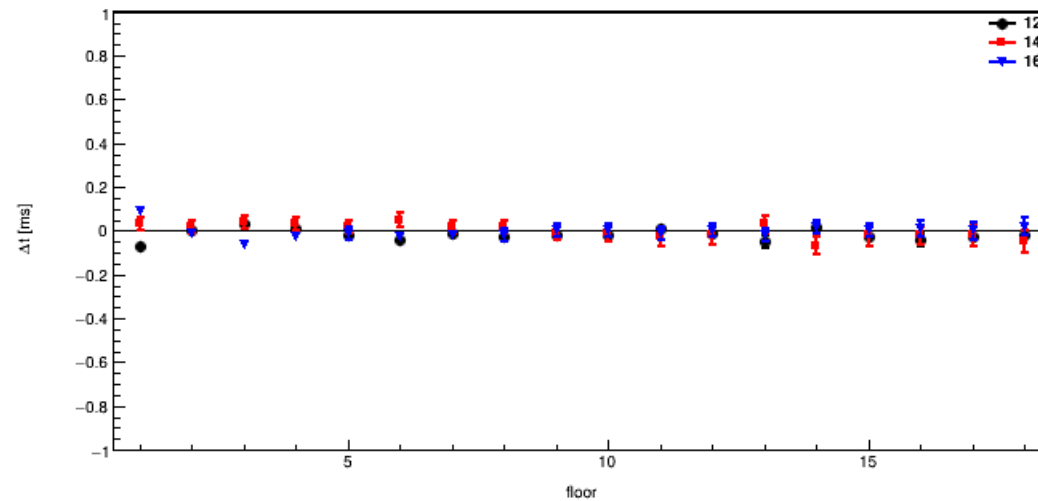


Position calibration (10)

before

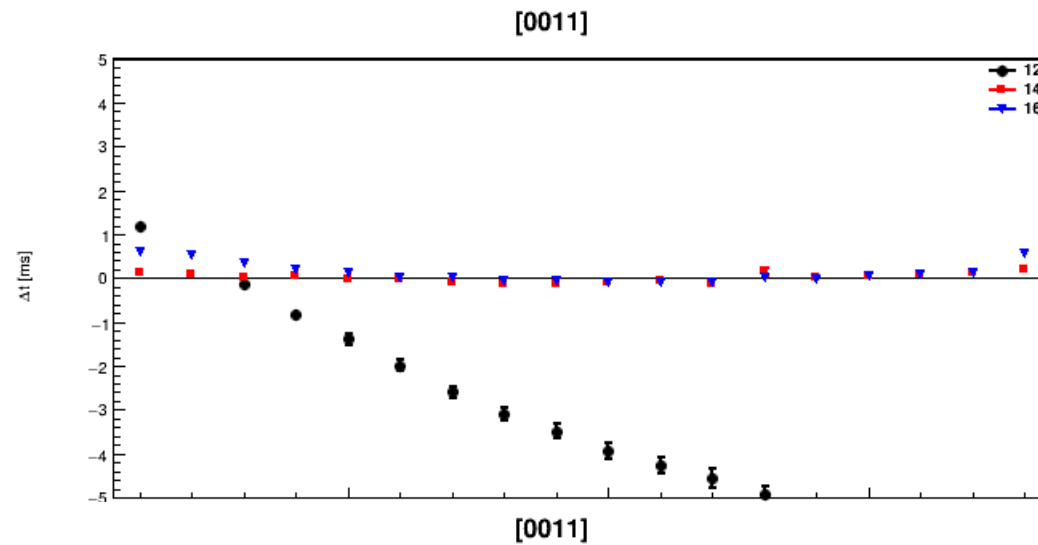


after

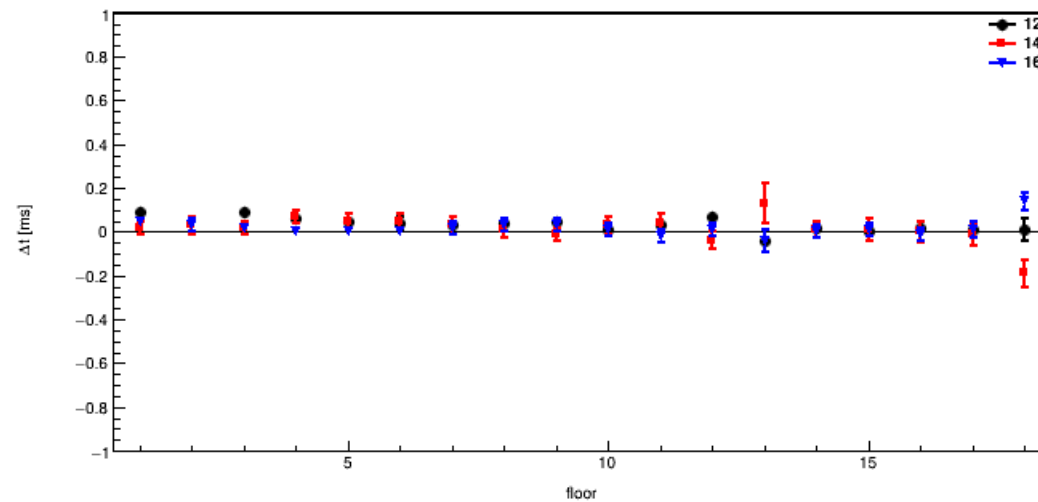


Position calibration (11)

before

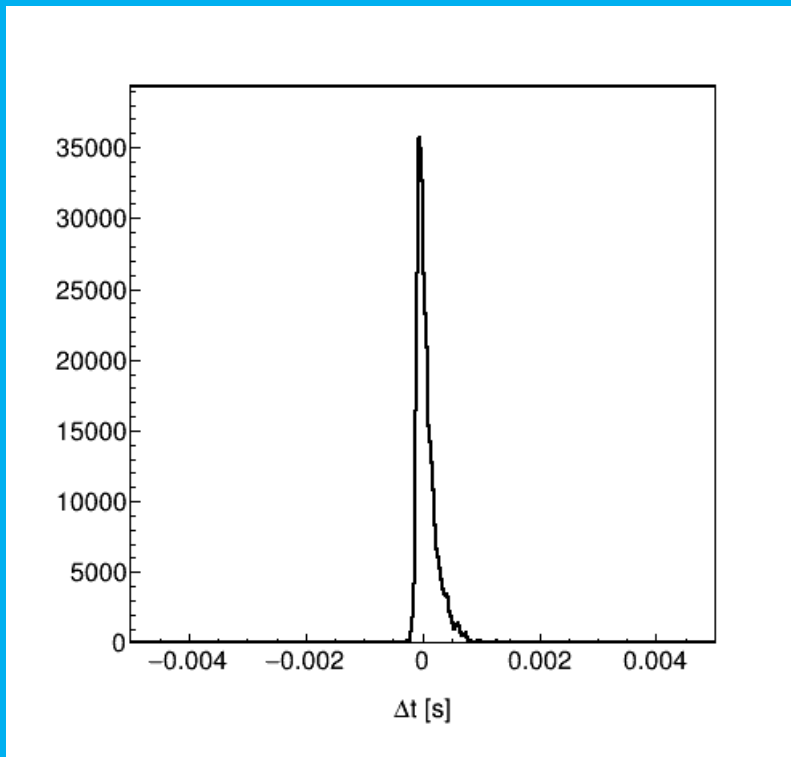


after

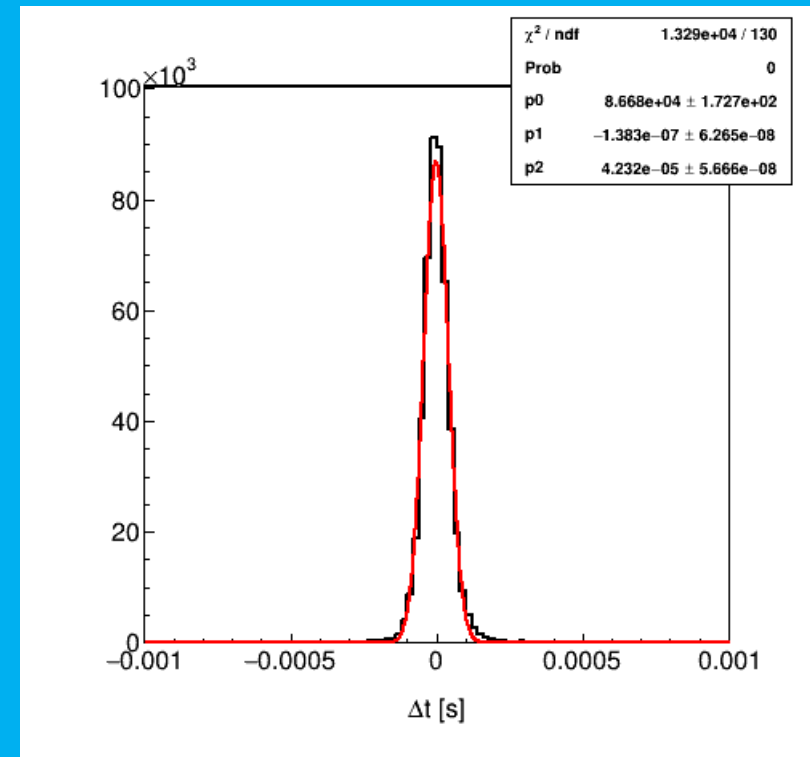


Position calibration

before



after



Conclusions

- Global fit works
 - total CPU time 25 seconds / run
 - average sigma time-of-arrival less than $50 \mu s$
 - no significant dependence on string, floor, tripod ($|\Delta t| \leq 200 \mu s$)