JKatoomba[¶]

M. de Jong

[¶] Named after a small town in the Blue Mountains, Australia.

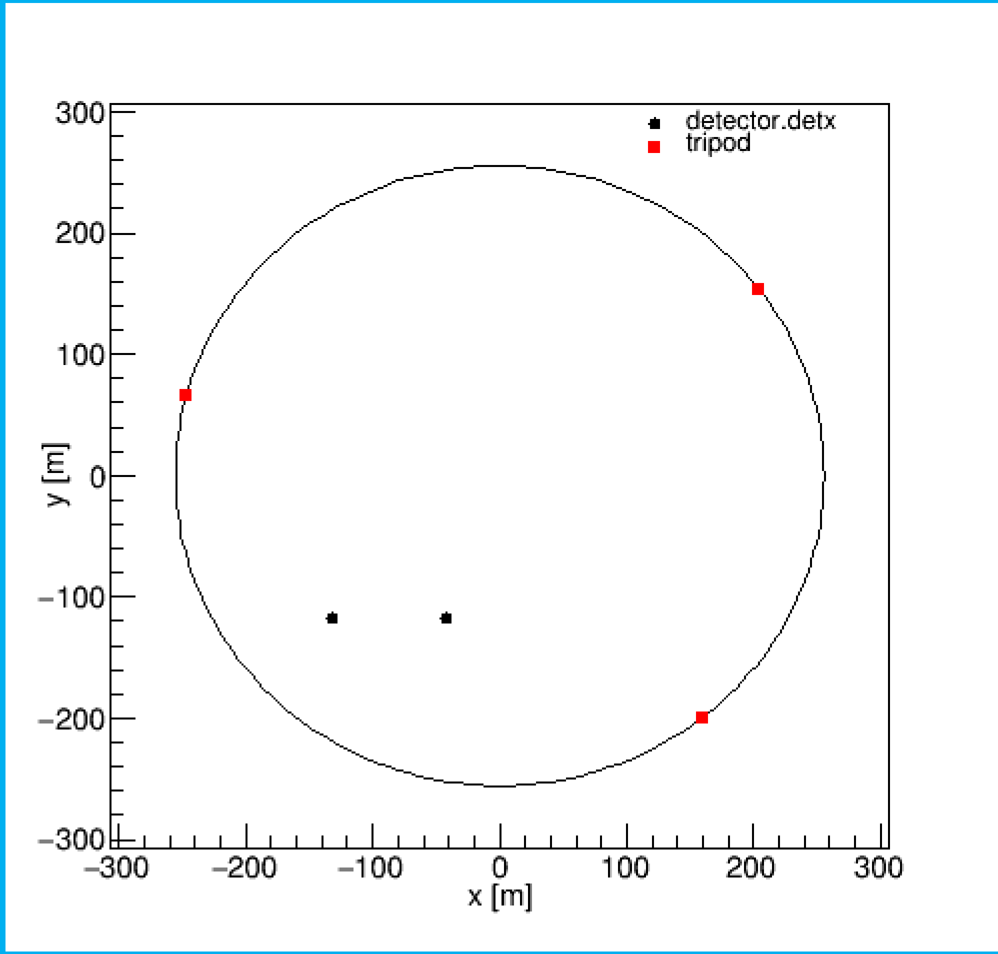
Simulation

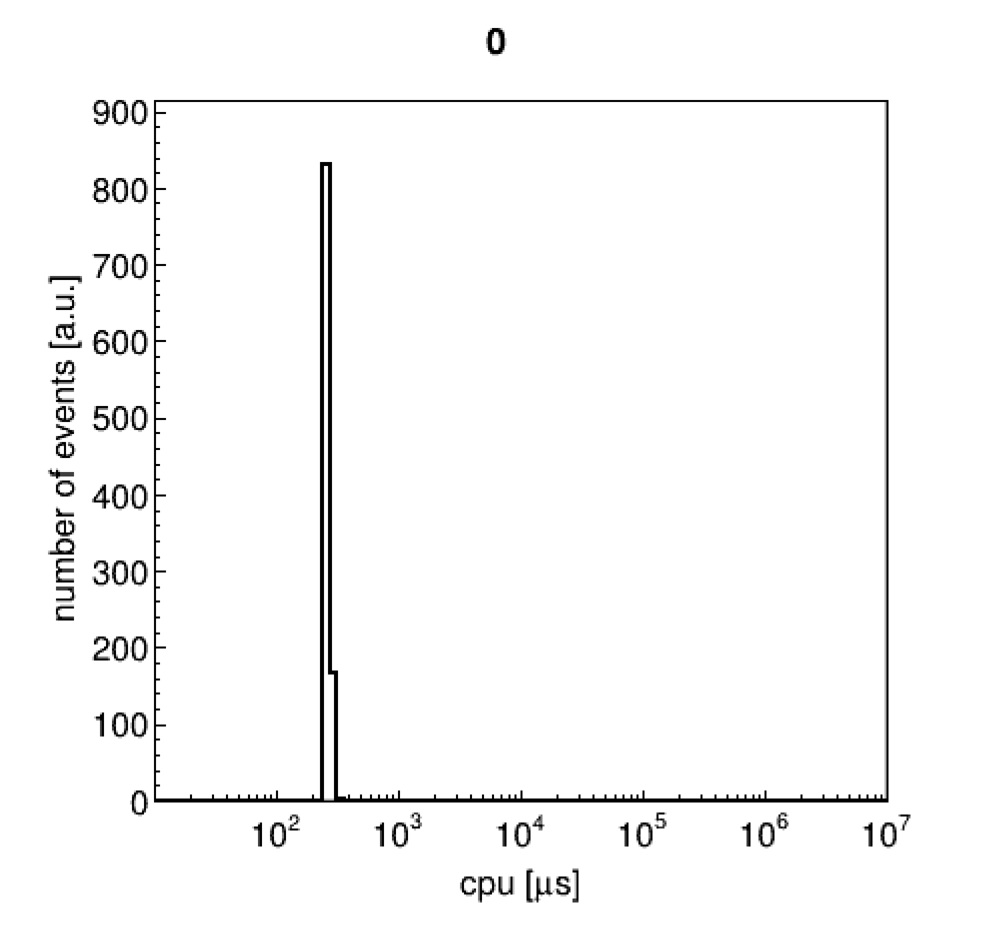
- randomised time-of-emission
  - t_0 = cycle time $\times\ 10s$
  - $t_1 = t_0 + [-1, +1]\ s$
- randomised tilt of each string
  - $T_x = [-0.01, +0.01]$
  - $T_y = [-0.01, +0.01]$
- resolution time-of-arrival
  - $\sigma_{t1} = 10\ \mu s$
- event
  - 10 pings / emitter

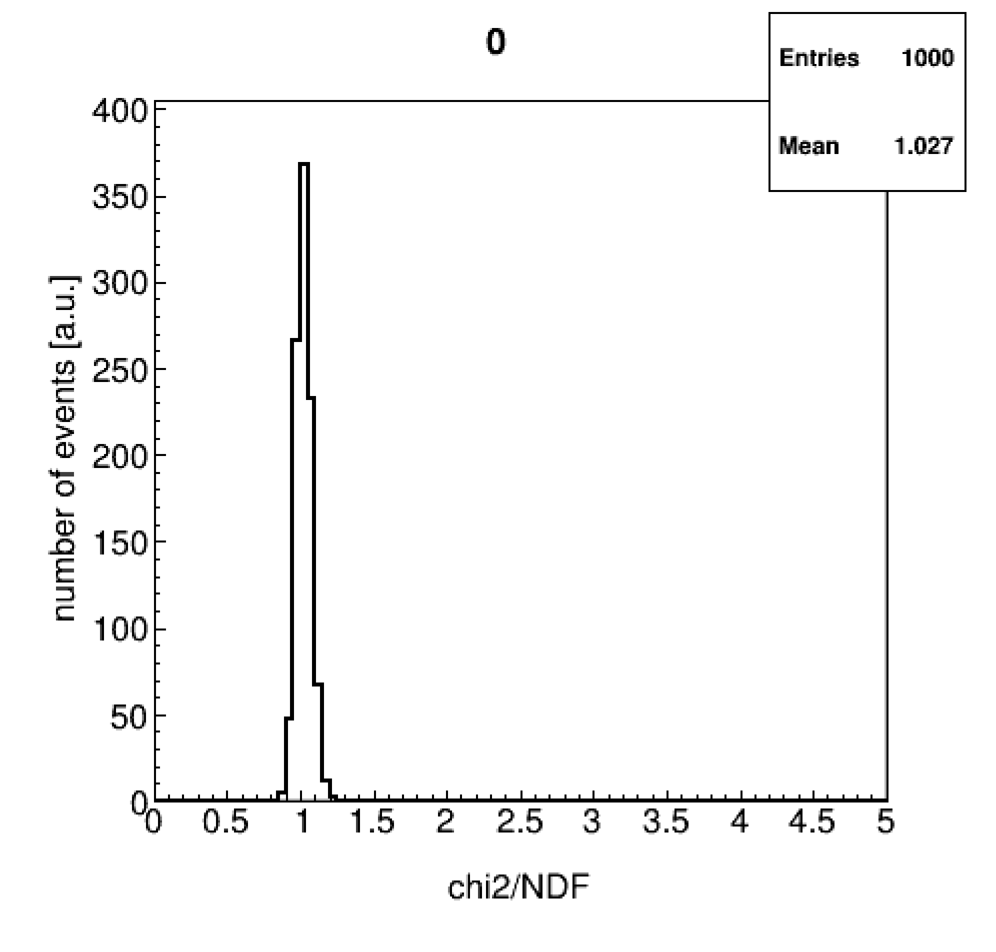
Fit

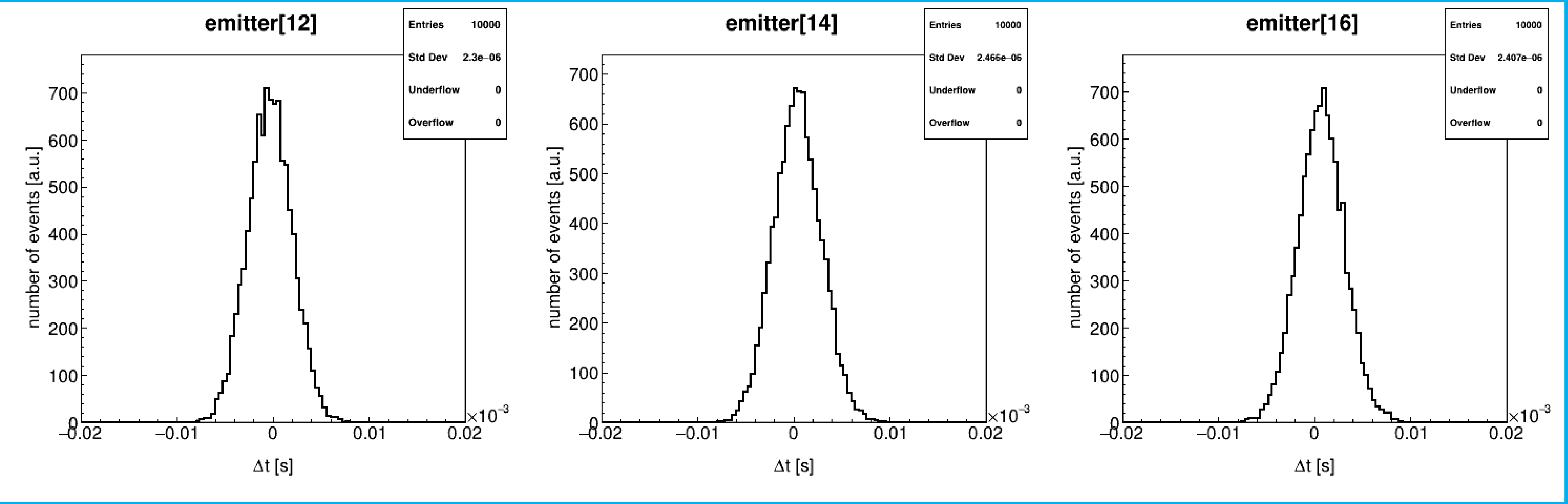
- Linear fit (see other presentation)
  - model parameters
    - t_a^n time-of-emission of emitter a and ping n
    - T_x^i slope (dx/dz) of string i
    - T_y^i slope (dy/dz) of string i

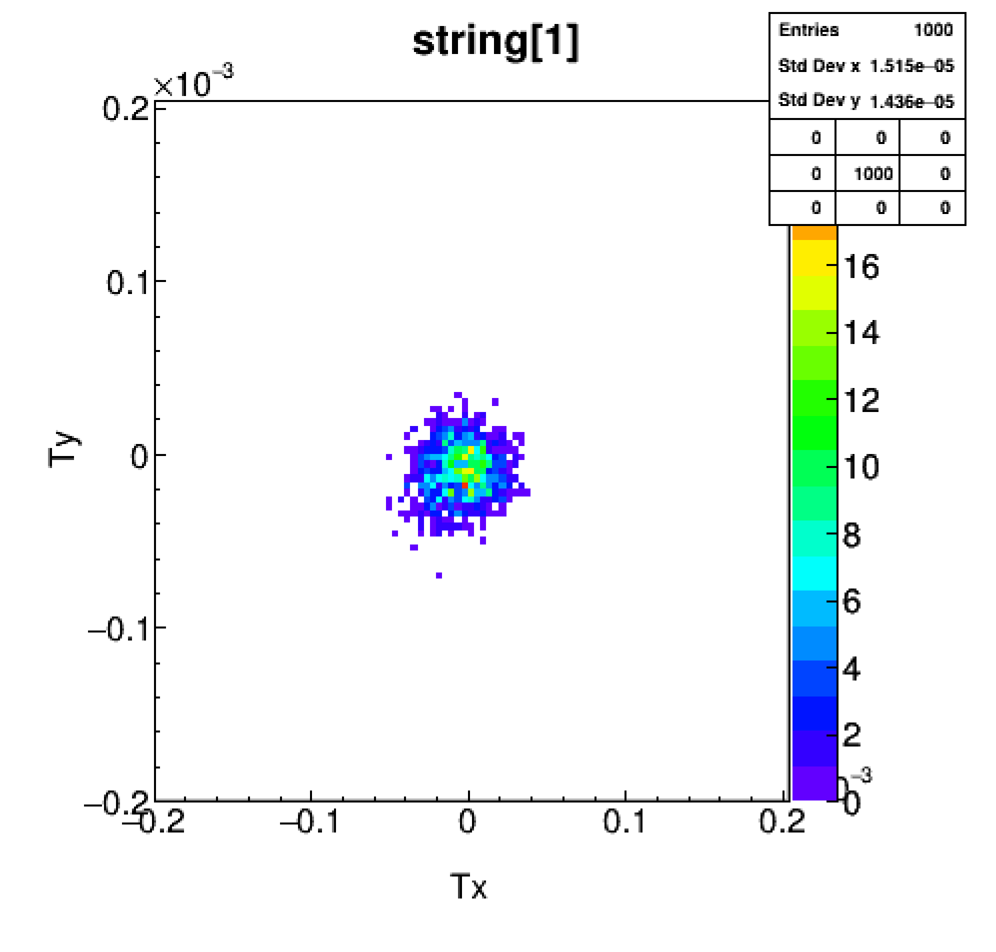
ARCA footprint

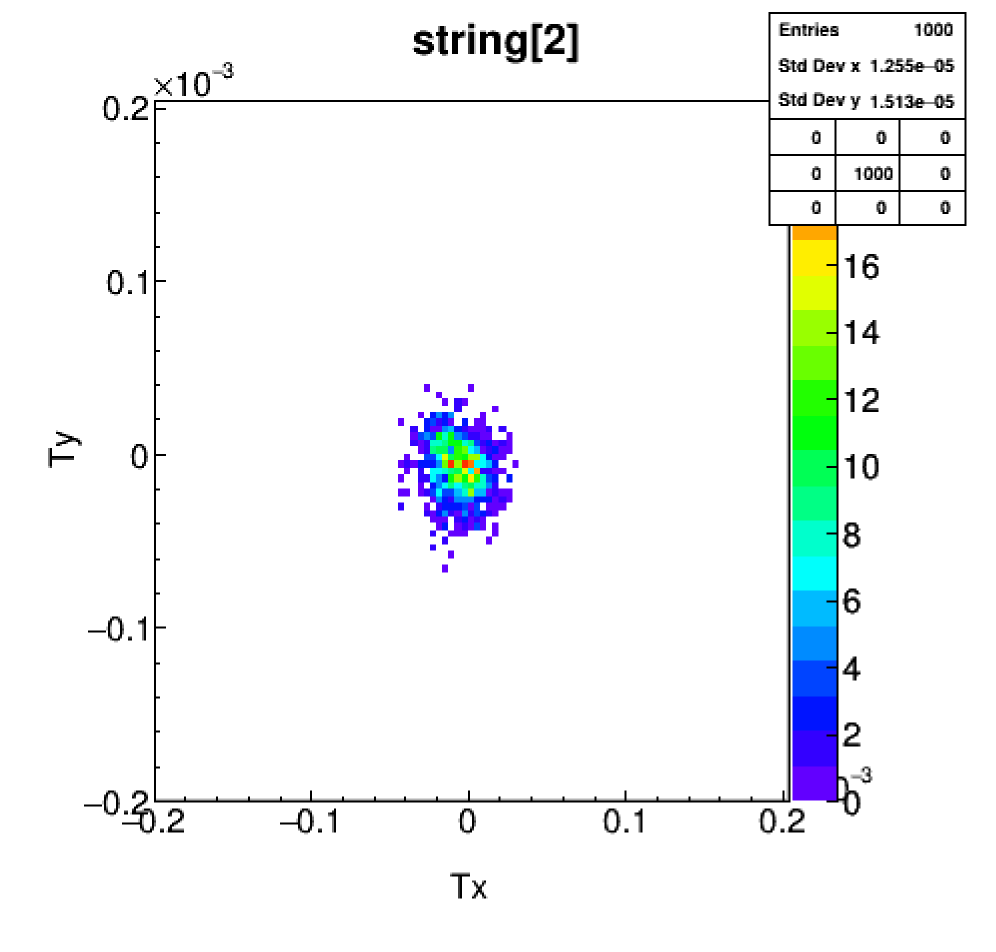


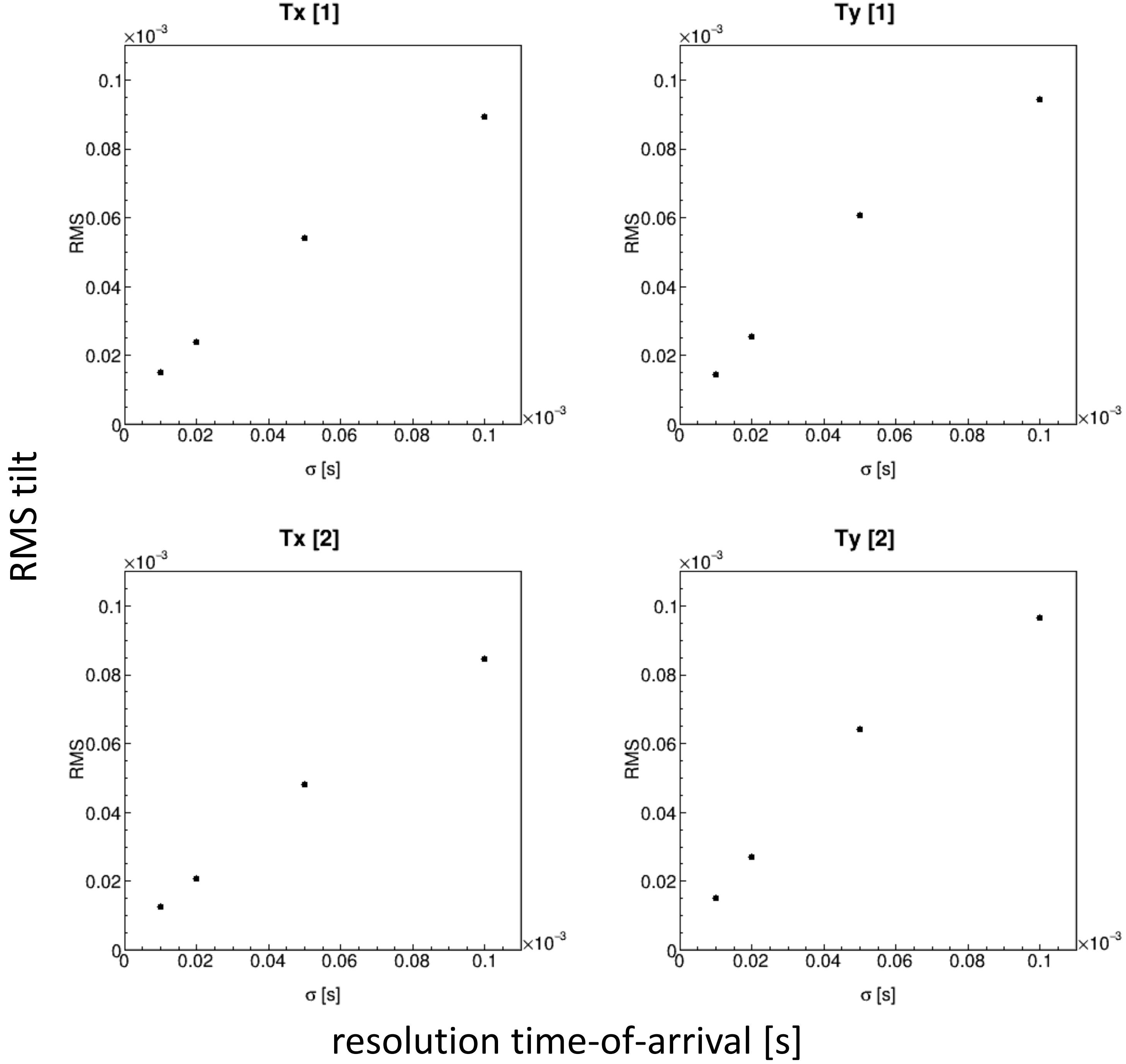

0
900
800
700
600
500
400
300
200
100
0
number of events [a.u.]
10^2
10^3
10^4
10^5
10^6
10^7
cpu [μs]


0
Entries 1000
Mean 1.027
400
350
300
250
200
150
100
50
0
number of events [a.u.]
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
chi2/NDF


emitter[12]
Entries 10000
Std Dev 2.3e−06
Underflow 0
Overflow 0
number of events [a.u.]
Δt [s]
×10−3
emitter[14]
Entries 10000
Std Dev 2.466e−06
Underflow 0
Overflow 0
number of events [a.u.]
Δt [s]
×10−3
emitter[16]
Entries 10000
Std Dev 2.407e−06
Underflow 0
Overflow 0
number of events [a.u.]
Δt [s]
×10−3


string[1]
Entries 1000
Std Dev x 1.515e−05
Std Dev y 1.436e−05
0 0 0
0 1000 0
0 0 0
×10⁻³
0.2
0.1
0
−0.1
−0.2
Ty
Tx
16
14
12
10
8
6
4
2
0


string[2]
Entries 1000
Std Dev x 1.255e−05
Std Dev y 1.513e−05
0 0 0
0 1000 0
0 0 0
×10⁻³
0.2
0.1
0
−0.1
−0.2
Ty
Tx
16
14
12
10
8
6
4
2
0



RMS $[mrad]$
$\cong$
σ $[ms]$

Conclusions & Outlook (1/2)

- Basic simulation of acoustics data exists
  - detector with acoustic receivers in each optical module; and
  - tripods with autonomous acoustic emitters
- Fit of model to acoustic data can accurately be linearized
  - For (small) ARCA footprint, three acoustic emitters and time-of-arrival resolution of $10\ \mu s$

    $\Rightarrow$ tilt of each string is determined with a resolution of about 1.5×10^{-5}

Conclusions & Outlook (2/2)

- Apparently no critical dependence of position calibration on availability of working hydrophones
  - more tripods are probably better (and easier to realise)
- Detailed information needed to tune simulations
  - number and UTM coordinates of tripods
  - position top of T-bar on anchor with respect to UTM coordinate of detector
  - expected time-of-arrival resolution