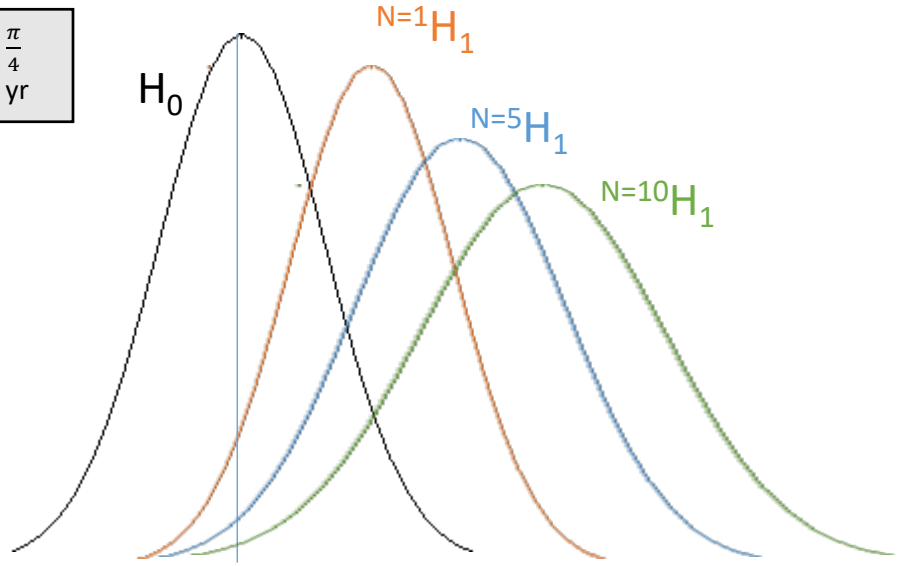
Groupmeeting

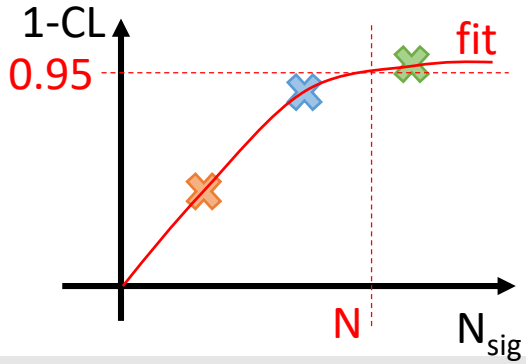
Rasa Muller
rasam@nikhef.nl

Getting to the sensitivity plot

- For certain **declination**:
  - For certain amount of **data-taking-years**
    - Loop over $N_{signalevts}$ in S+B model & Determine CL
      - N=1
        CL=0.08 → 1-CL = 89%
      - N=5
        CL=0.04 → 1-CL = 94%
      - N=10
        CL=0.04 → 1-CL = 96%

$\delta = \frac{\pi}{4}$
T = 3 yr





```
x_N[ ty1.0_sd-0.9 ]     :  ['0', '10', '2', '4', '6', '8', '0.1', '0.2', '0.3', '0.4
', '0.5', '0.6', '0.7', '0.8', '0.9', '1.0']
y_CL[ ty1.0_sd-0.9 ]    :  [0.4999157037486026, 0.0010015806514324125, 0.15848764731
82326, 0.04948834170868127, 0.016503521024173684, 0.004801330006081652, 0.4814980920
454271, 0.4579957177910012, 0.429056678353415, 0.3594997880051868, 0.381258115079400
9, 0.35972909422570004, 0.3431620115645939, 0.2924006173560103, 0.2824184324348795,
0.28864974388666553]
n_psexp[ ty1.0_sd-0.9 ] :  [10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10
000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000
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```
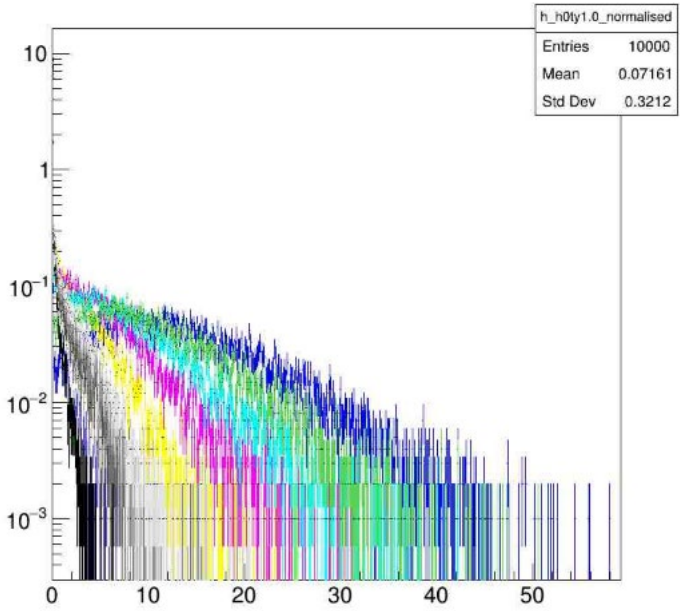
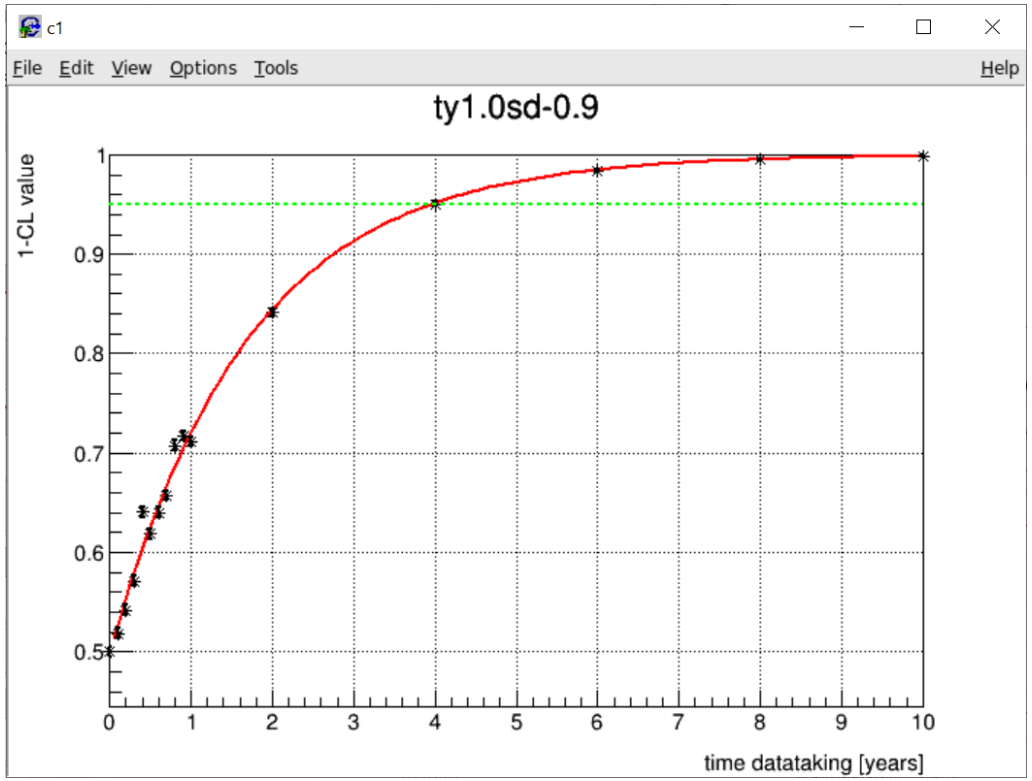

Ty1.0_sd-0.9





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x_N[ ty1.0_sd-0.45 ]     :  ['0', '10', '2', '4', '6', '8', '0.1', '0.2', '0.3', '0.
4', '0.5', '0.6', '0.7', '0.8', '0.9', '1.0']
y_CL[ ty1.0_sd-0.45 ]    :  [0.49685706597067325, 0.0013008136501553458, 0.150349270
2345238, 0.05116498133142517, 0.014251371193019276, 0.006062551041076025, 0.47313059
20722147, 0.44381603514551005, 0.4103676358076063, 0.3916974762571084, 0.35856503299
44523, 0.3375898929866925, 0.31727214902785233, 0.2983134618506996, 0.27864738698520
714, 0.2663263683088759]
n_psexp[ ty1.0_sd-0.45 ] :  [10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 1
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0.0]
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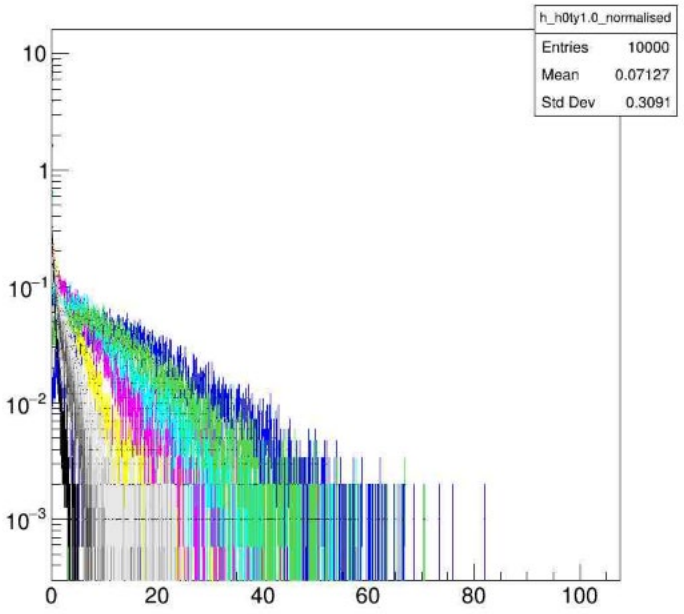
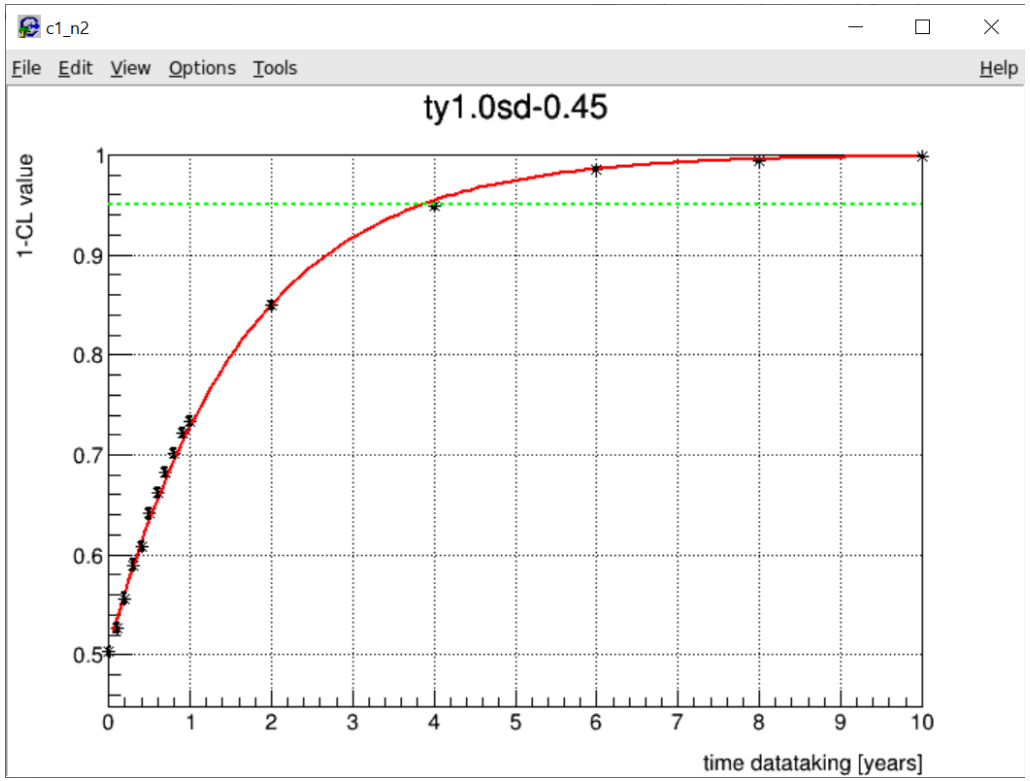
Ty1.0_sd-0.45





```
x_N[ ty1.0_sd0.0 ]     :  ['0', '10', '2', '4', '6', '8', '0.1', '0.2', '0.3', '0.4'
, '0.5', '0.6', '0.7', '0.8', '0.9', '1.0']
y_CL[ ty1.0_sd0.0 ]    :  [0.5001050892569651, 0.00150086629701871, 0.15002692145184
673, 0.04544408690842842, 0.013500364132313036, 0.004301705151154557, 0.466053275236
14853, 0.44740335470266107, 0.4202554605827306, 0.39606797027238183, 0.3704541504207
3493, 0.33191845368086104, 0.3345899434783145, 0.315850335058632, 0.2954836287293686
, 0.278101757506319]
n_psexp[ ty1.0_sd0.0 ] :  [10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 100
00.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.
0]
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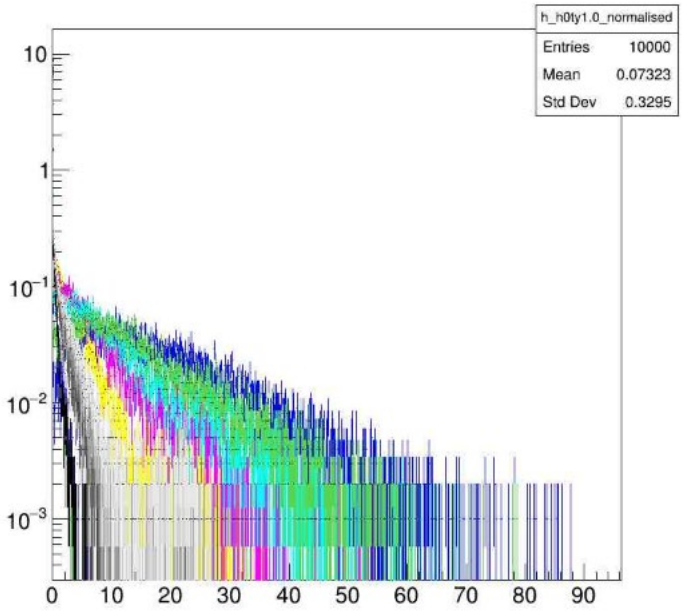
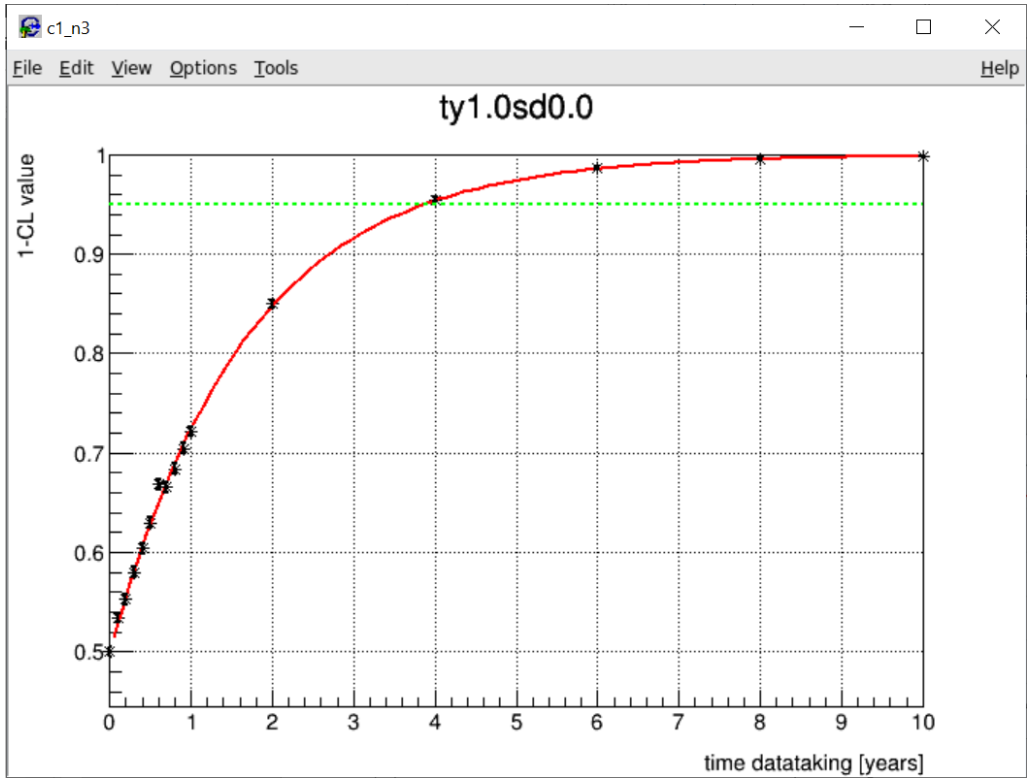
Ty1.0_sd0.0





```
x_N[ ty1.0_sd0.45 ]     :  ['0', '10', '2', '4', '6', '8', '0.1', '0.2', '0.3', '0.4
', '0.5', '0.6', '0.7', '0.8', '0.9', '1.0']
y_CL[ ty1.0_sd0.45 ]    :  [0.49991668286956276, 0.0010004457934360339, 0.1457338334
4228819, 0.04425714971688776, 0.012345603715011817, 0.0037013583789232505, 0.4646103
0628491323, 0.43670826481821023, 0.4084296617629914, 0.38498318151461136, 0.35791350
98104225, 0.33918576992673255, 0.3177310680328945, 0.3009876850905929, 0.28420032137
217405, 0.2682823800675282]
n_psexp[ ty1.0_sd0.45 ] :  [10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10
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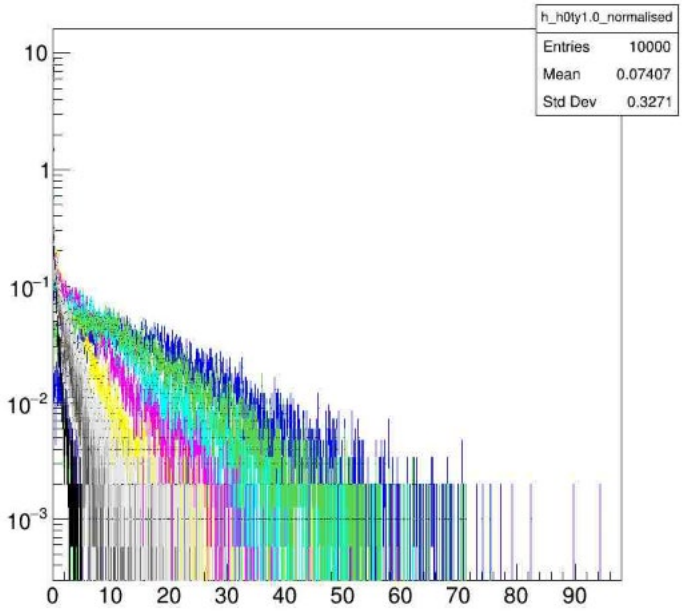
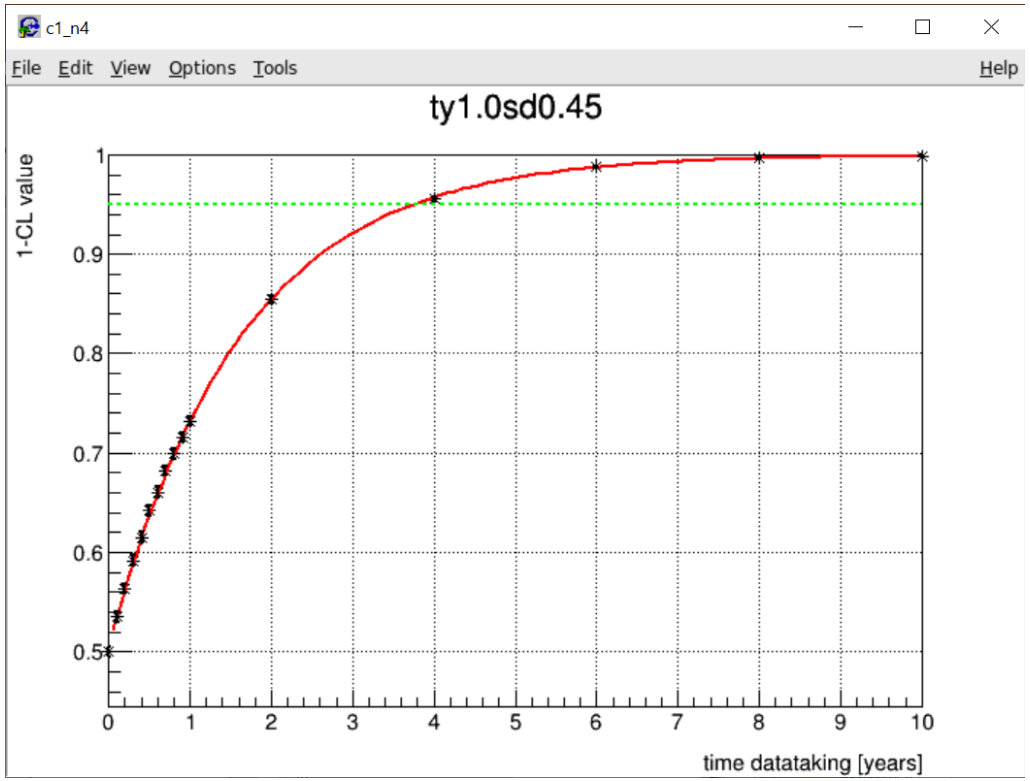
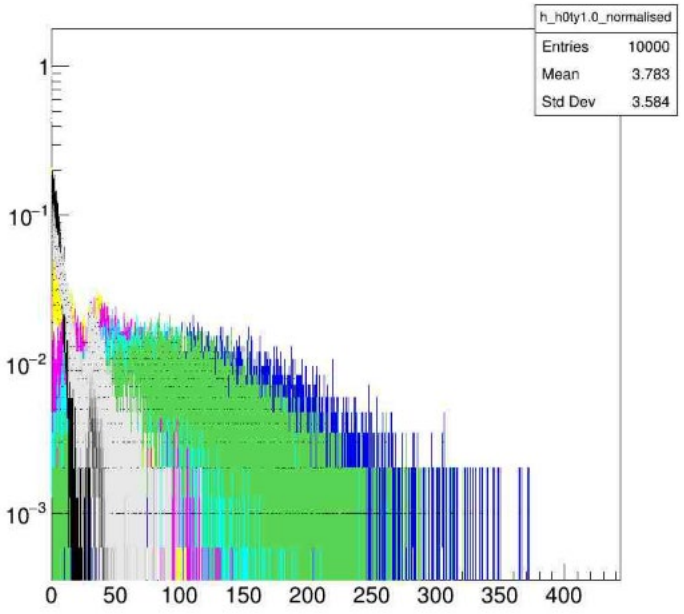
Ty1.0_sd0.45

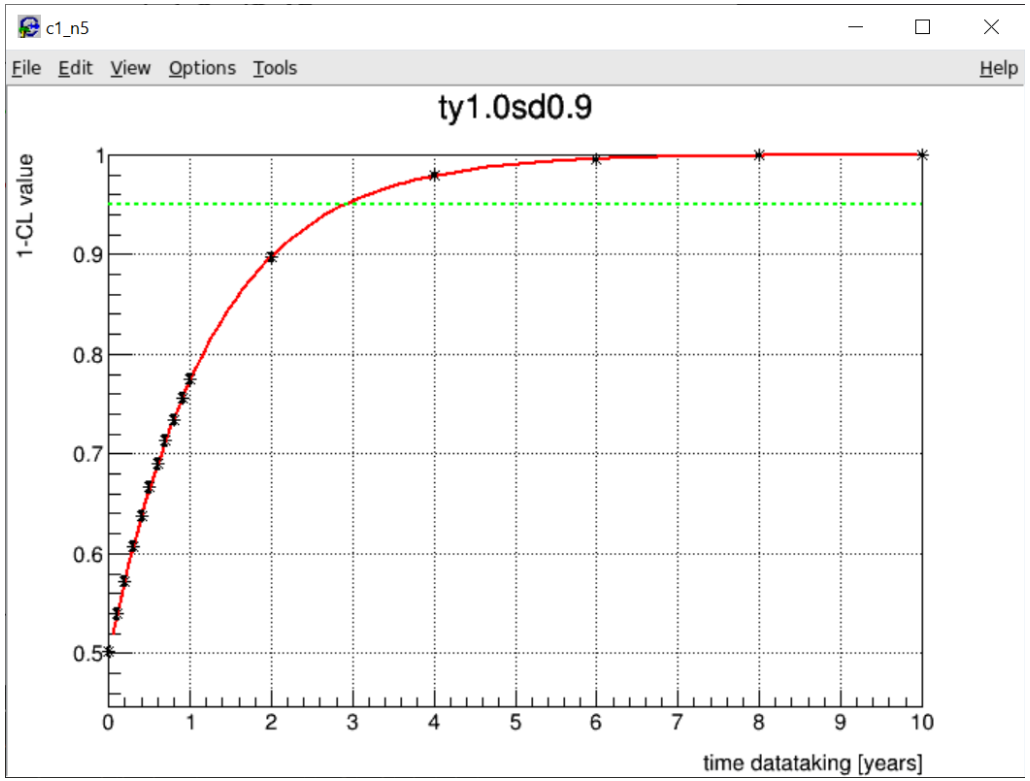




```
x_N[ ty1.0_sd0.9 ]     :  ['0', '10', '2', '4', '6', '8', '0.1', '0.2', '0.3', '0.4'
, '0.5', '0.6', '0.7', '0.8', '0.9', '1.0']
y_CL[ ty1.0_sd0.9 ]    :  [0.49833241877334544, 8.708488749706733e-05, 0.10307656885
676685, 0.02027740513652664, 0.0046376634664004185, 0.0006465574986947368, 0.4603336
6272610554, 0.4280427672024126, 0.39270288126769287, 0.36250876887620204, 0.33368202
81774547, 0.31032411215736705, 0.2870246449627548, 0.26563408450939957, 0.2442584703
5656253, 0.22548466714529591]
n_psexp[ ty1.0_sd0.9 ] :  [10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 100
00.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.0, 10000.
0]
```

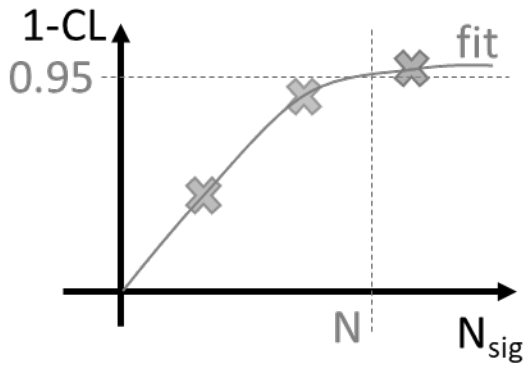
Ty1.0_sd0.9



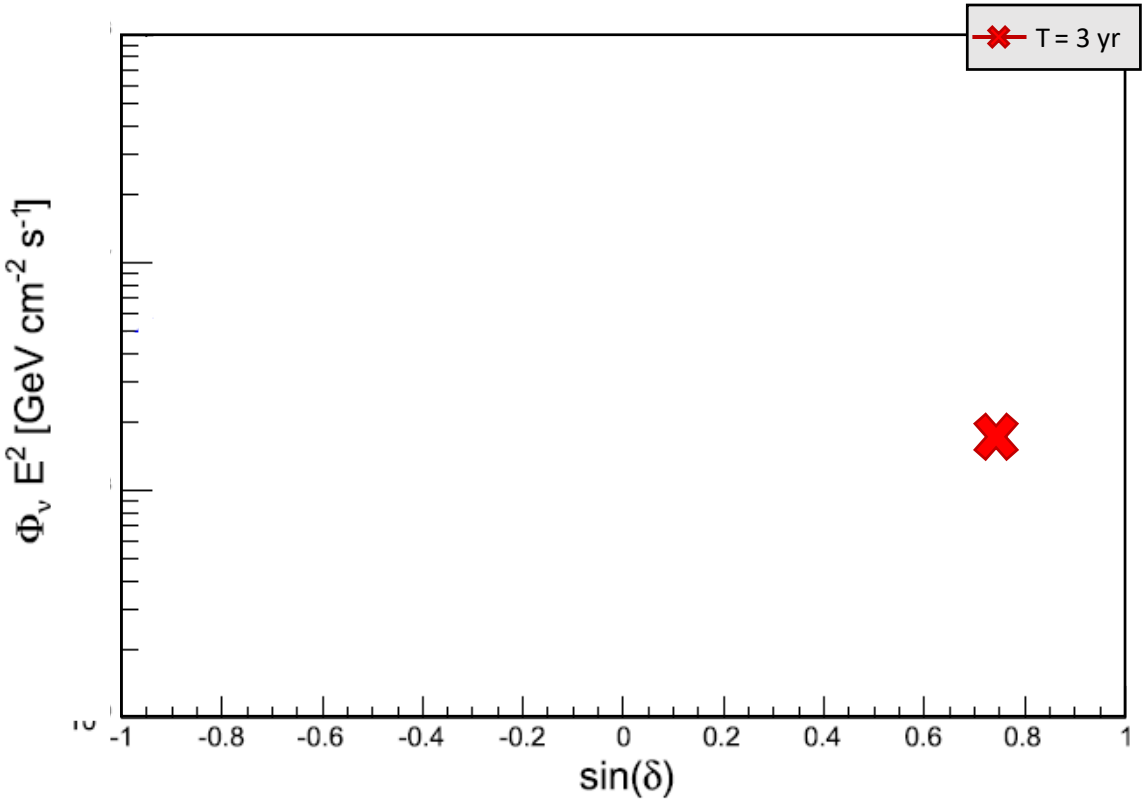


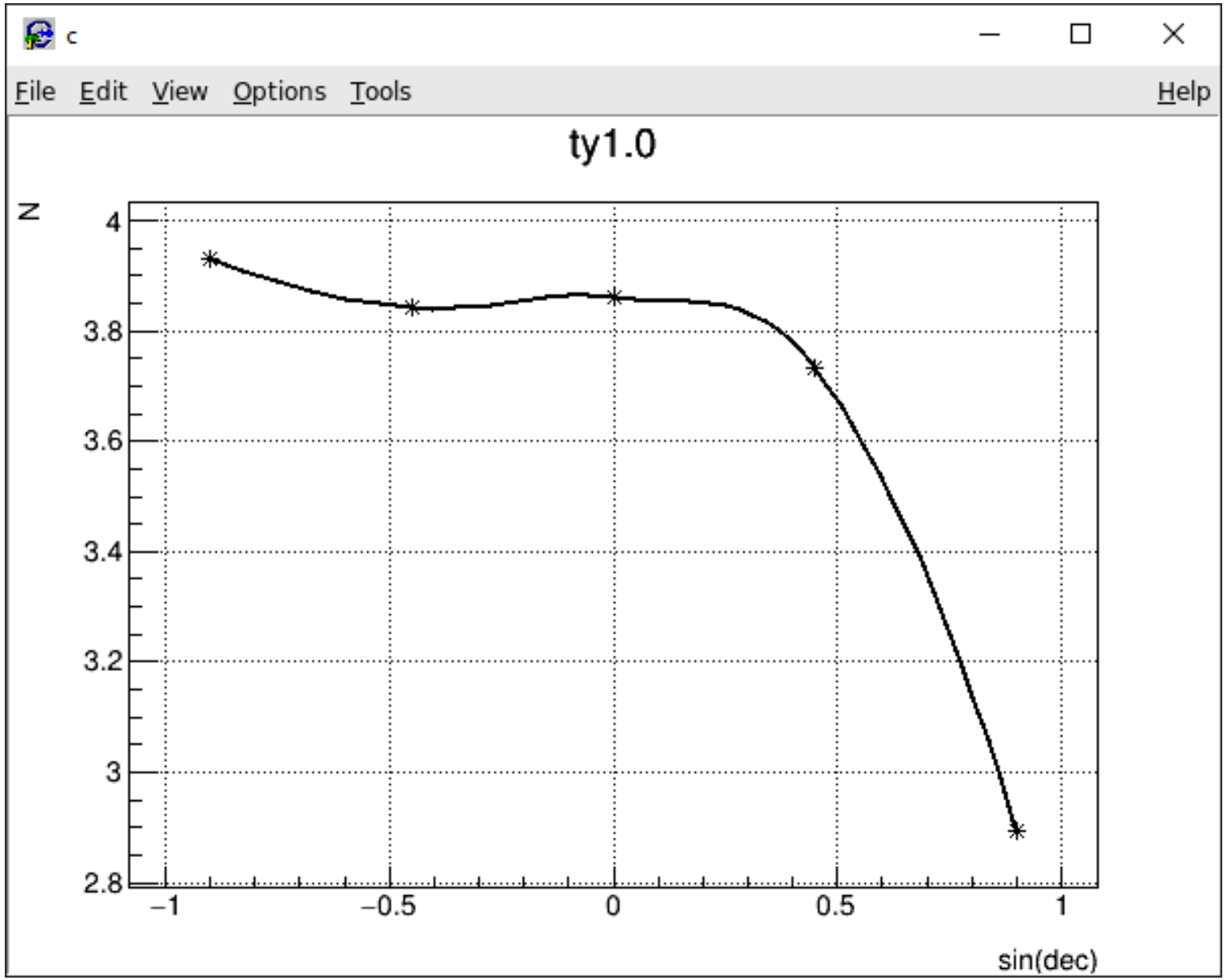
To get one point @ plot

- For this **declination**: $\sin(\delta) = \sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2} = 0.707\ldots$
  - For this amount of **data-taking-years**



  - Relate N to **flux**
    - $\mathrm{N} = \Phi(E)\ \mathrm{dE}\ \mathrm{dA}\ \mathrm{dT}$
    - $\mathrm{N} = \mathrm{C}\ \mathrm{E}^{-2}\ \mathrm{dE}\ \mathrm{dA}\ \mathrm{dT}$
    - $\Phi_\nu E^2 = C = \frac{N}{dE\ dA\ dT}$




c
File Edit View Options Tools Help
ty1.0
N
4
3.8
3.6
3.4
3.2
3
2.8
−1
−0.5
0
0.5
1
sin(dec)

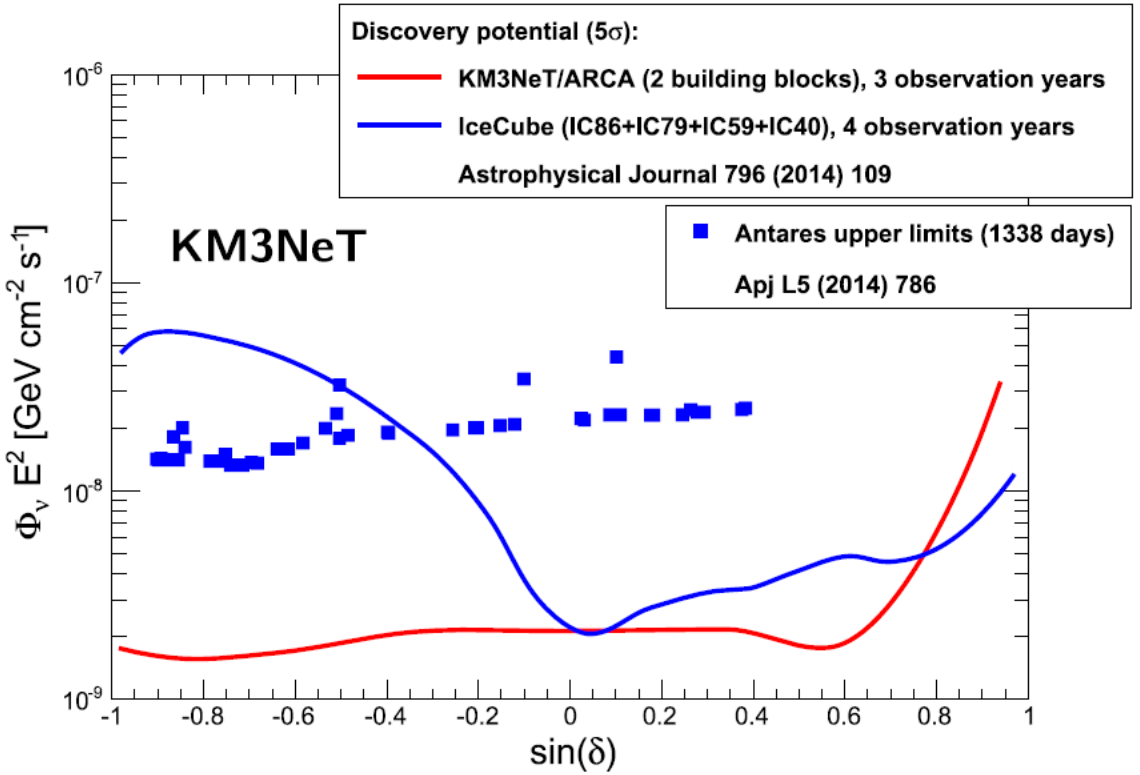
TODO [short term]

- N ➔ Φ
- Compare to previous studies KM3NeT/IceCube studies

- Include more datapoints per year
- Include more years

- Clean up scripts / generalise for future studies

- Check ‘zero probability issue’ / weird bump



TODO [long term]

- Include other flavours => include showers => include Tau (Thijs/Alfonso)
  - Fix small bug in detector response plots

- Improve framework possibilities
  - Time dependency
  - Extended sources (Vladimir/Matteo/Barbara)
  - BDT/Machine Learning (Alfonso)

- Prepare for ‘real-data’ analyis
- 6/20/… line production (instead of 1 BB)