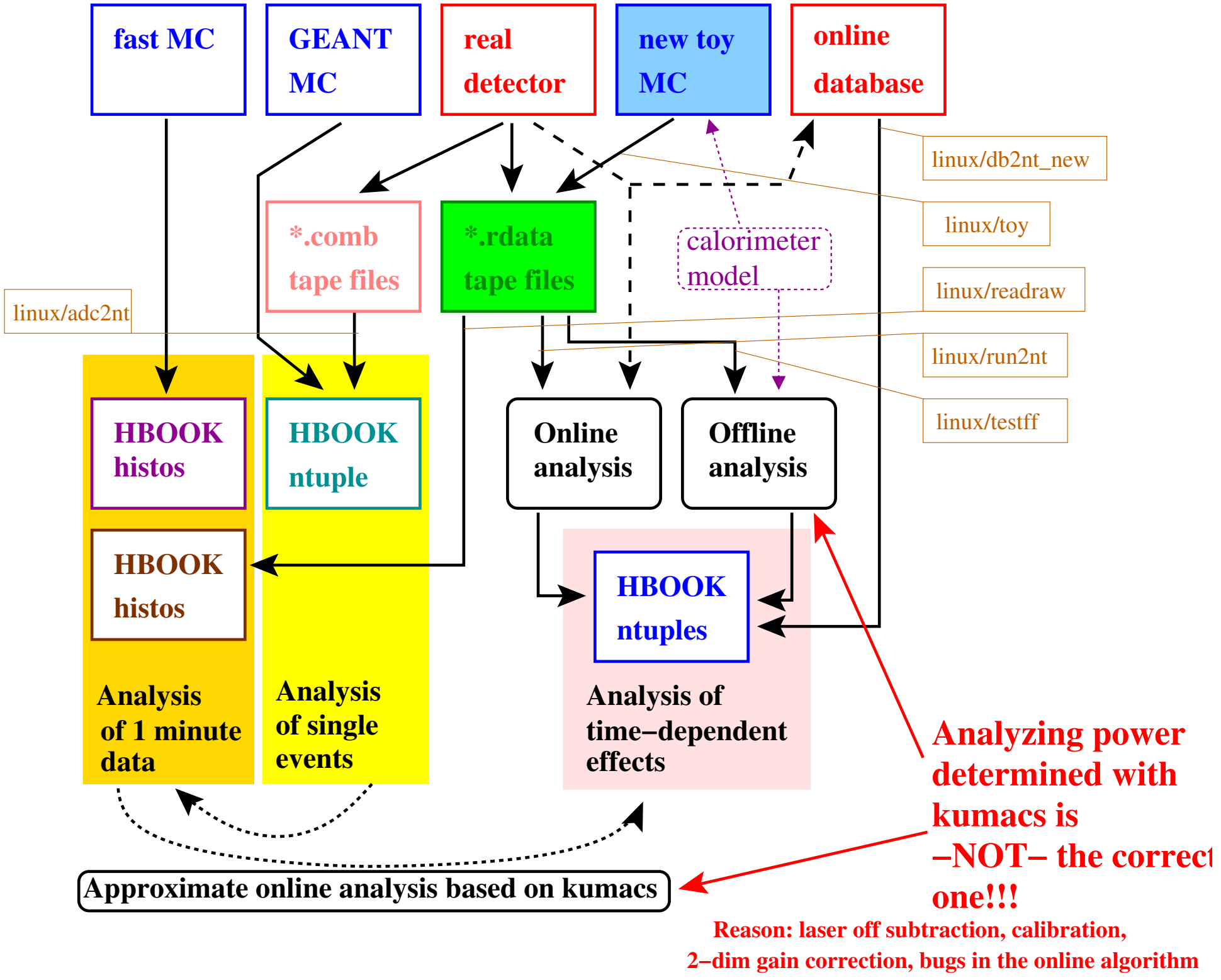
TPOL AP from Monte Carlo and LPOL/TPOL ratio: some ideas

- TPOL data flow
- The new TOY Monte Carlo
- How to use the new TOY Monte Carlo
- Study: gain correction
- Study: secondary beam
- Study: IP distance
- LPOL/TPOL ratio: common ntuple?

The TPOL data flow



The new TOY Monte Carlo

- Produce lasers off/laser on data, write out TPOL data format

  Background subtraction, calibration, online analysis is repeated **exactly** in parallel to the real data

- Detailed model of ADC digitisation including overflow effects
- Include secondary Gaussian for beam profile, pileup, ... all effects which are included in the offline fit
- Generic calorimeter model in parallel to offline fit.

→ Offline fit can be applied and checked for biases

→ Parameters determined from offline fit can be fed back to the TOY MC easily.

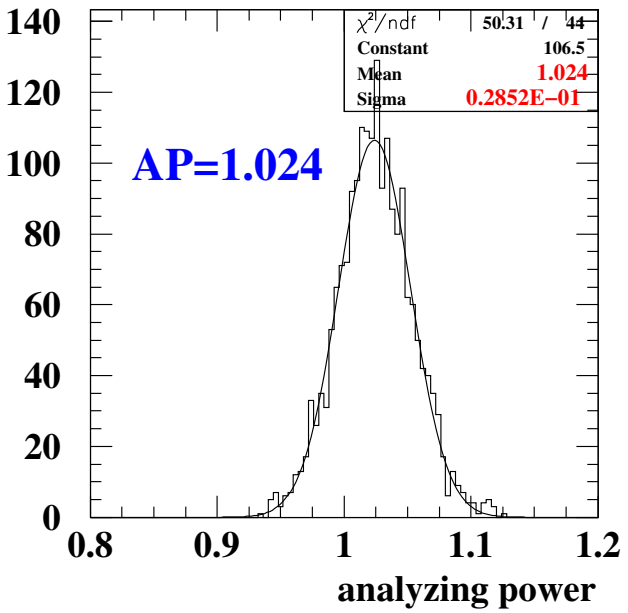
How to use the new TOY Monte Carlo

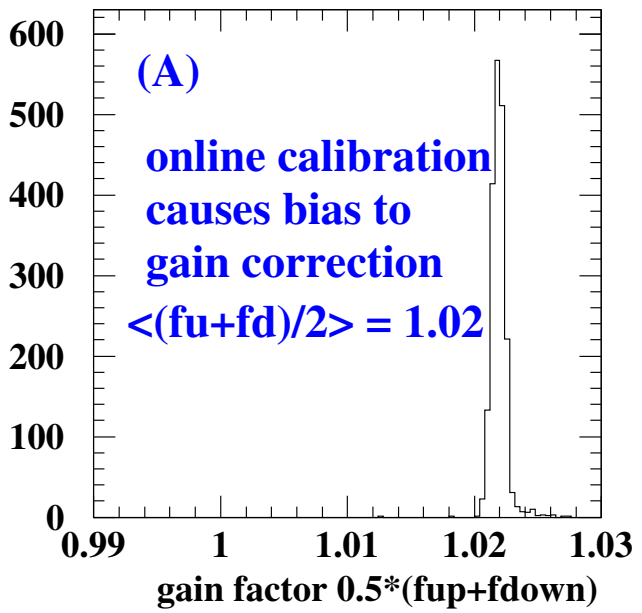
```
$ linux/toy -h
usage: linux/toy [-L lf -R rf -c cycles -h -i initpar -n nevent -o output -t temp -v verbos

   -L : normalize to (s1*lf)**2+s3**2==1 (default=1)
   -R : normalize to (s1*rf)**2+s3**2==1 (default=1)
   -c : number of on/off cycles (default=1)
   -h : print this help text
   -i : parameters for this MC run (default=mcparameters.txt)
   -n : number of events per on-cycle (default=2000000)
   -o : output file for data (default=mctest.rdata)
   -t : temporary file for one cycle (default=mctest.cycle)
   -v : verbose printout (default=1)
```

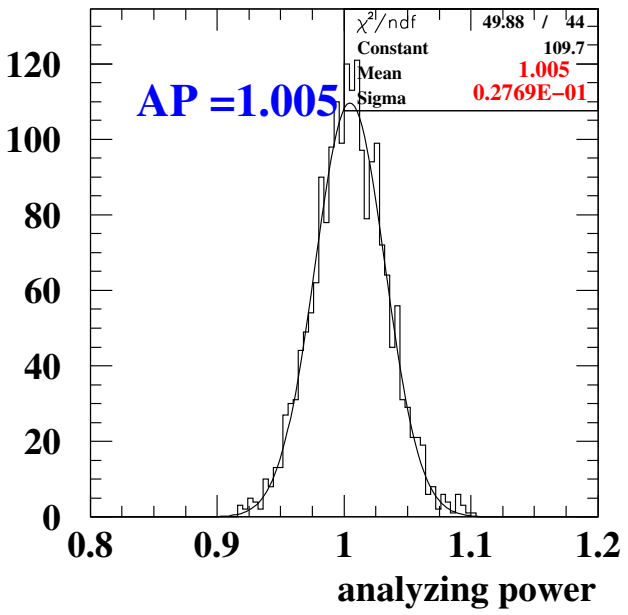
Steering file:

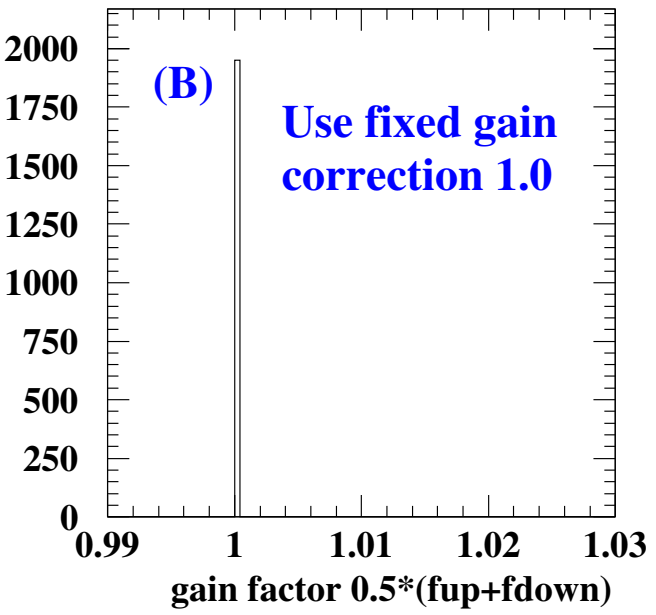
```
  PILEUP = 0.03    0.03
     S1R = 0       0.2
     S1L = 0       0.2
     S3R = -1
     S3L = 1
      PY = 0.5
      PZ = 0
      D0 = 65000   2000

...
```

Study: effect of online calibration









TOY MC study: fill histograms with true gain factors 1.0

Run online analysis 2x

(A) including online calibration

(B) online calibration switched off

Analyzing power differs by 2%!!!

Reason: reconstructed Compton edge is biased

2–dim (eta,E) resampling:

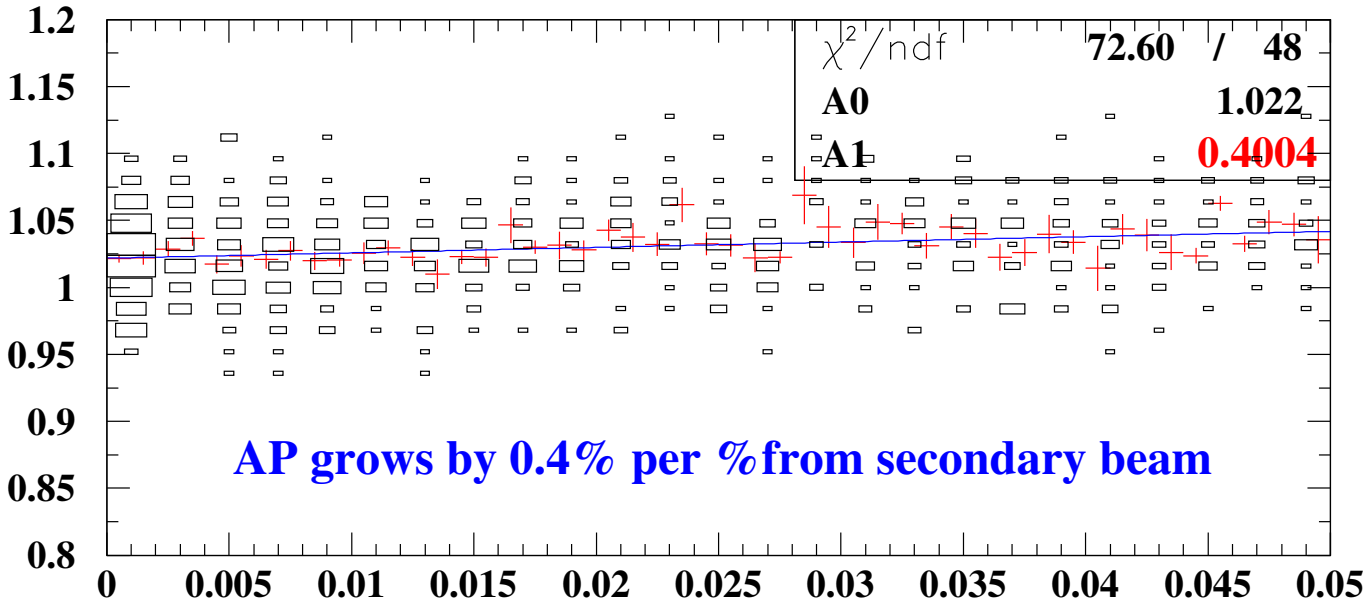
+ stability against gain variations

*** suffers from Cedge reconstruction bias**

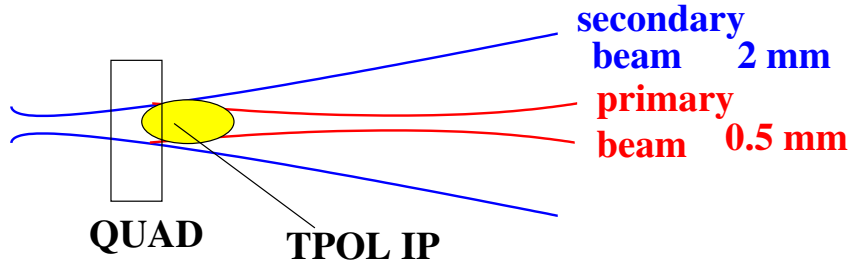
Question: are these effects taken into account in the "traditional" fast MC studies?

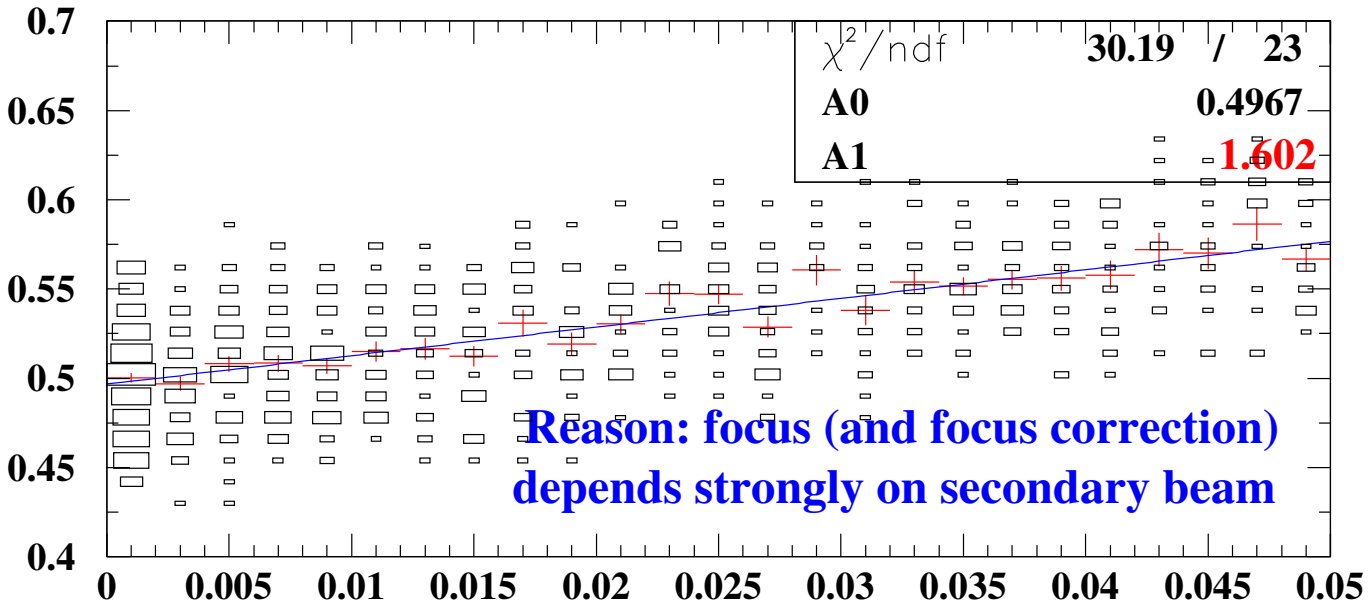
Probably not...

Study: effect of secondary beam



TOY MC study: change contribution from secondary (approx 4x wider) beam 0% –> 5%

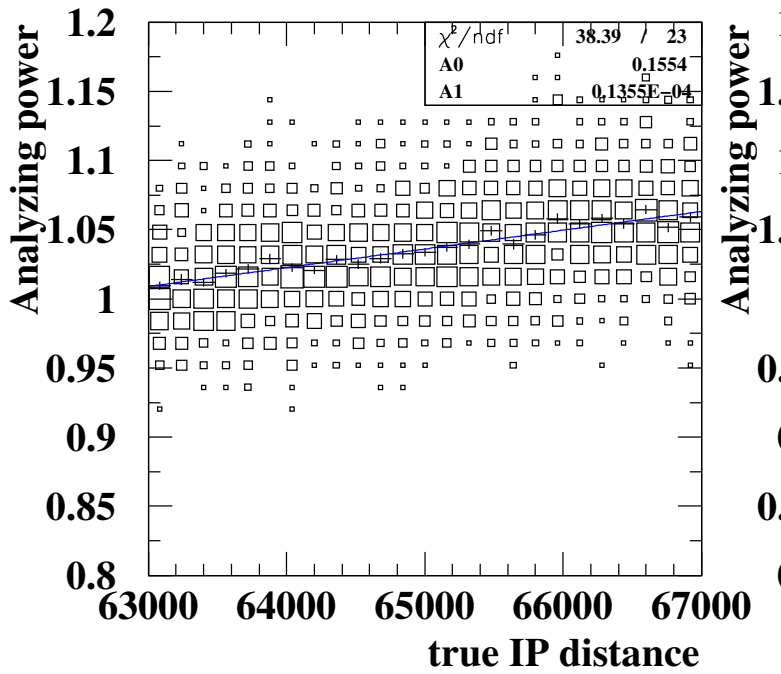


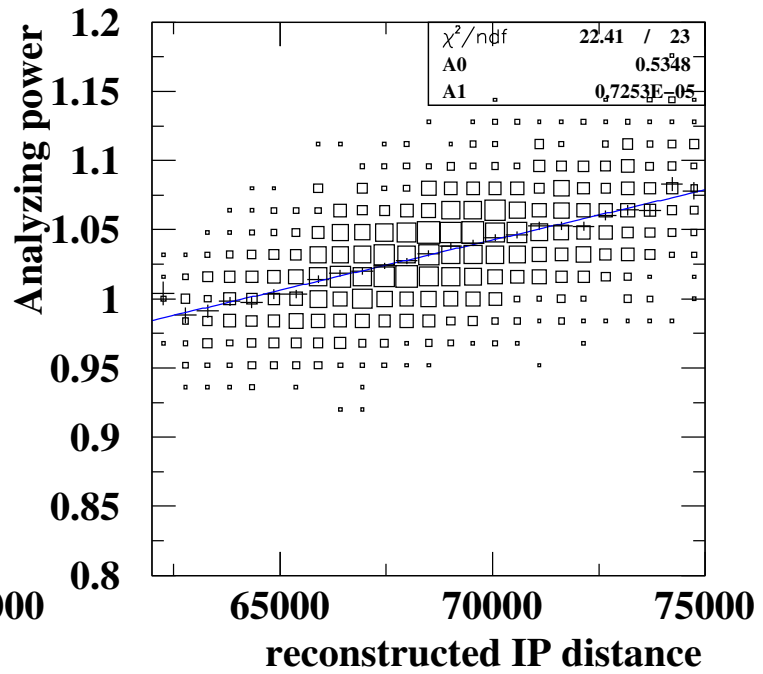


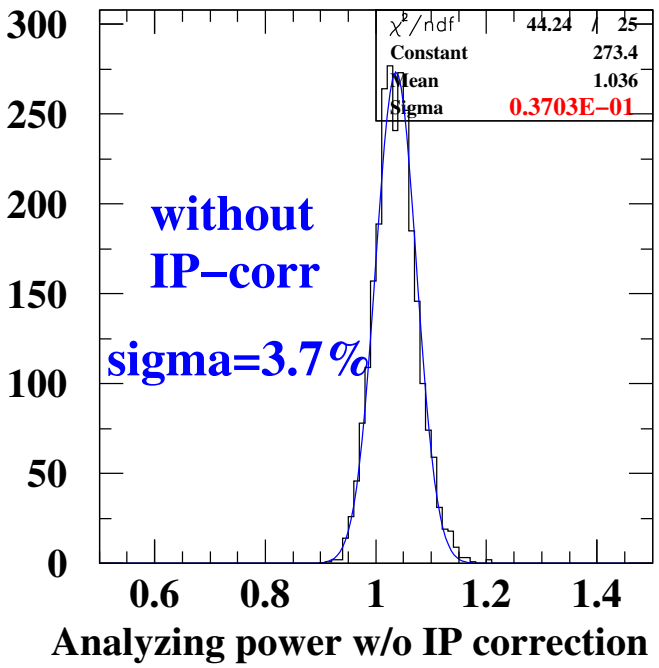
Comtribution from secondary beam estimated from offline analysis:

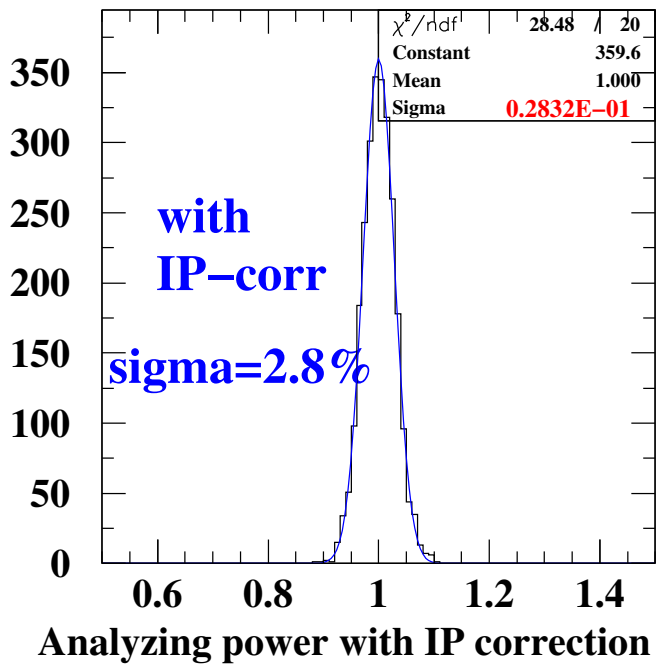
approx 3 % –> AP change 1.2%

Study: effect of IP distance









TOY MC study: vary IP distance from 63 m to 65 m

AP depends on IP distance

It is possible to reconstruct the IP distance from the lowest energy bin

distip = RMS(eta)*dy/deta *sqrt(2) /sin(theta(<E>))

Predicted IP correction:

AP = AP0/(1+(IP−IPnom)/138m)

LPOL/TPOL ratio: common ntuple?

Existing tools:

- Oracle (many parameters missing)
- Wouter's WWW page + private tools (complete (?) LPOL)
- TPOL online database + tools for online plots

  Missing online variable from TPOL side: IP distance

Proposal: reprocess all TPOL data

- Apply calibration to the correct cycle (online: use calibration from preceeding cycle)

  Tiny effect, but will be done for free
- Calculate IP distance → systematic studies
- Perhaps: apply new focus correction
- Perhaps: apply IP correction
- Critical point: contribution from secondary beam

  No "fast" algorithm known to estimate this contribution
- Less Critical: pileup (no plot shown): little influence on AP

  No "fast" algorithm known to estimate this contribution

...and merge with LPOL data to one big ntuple (averaged over 1,10,100 minutes)