Optics Status Update

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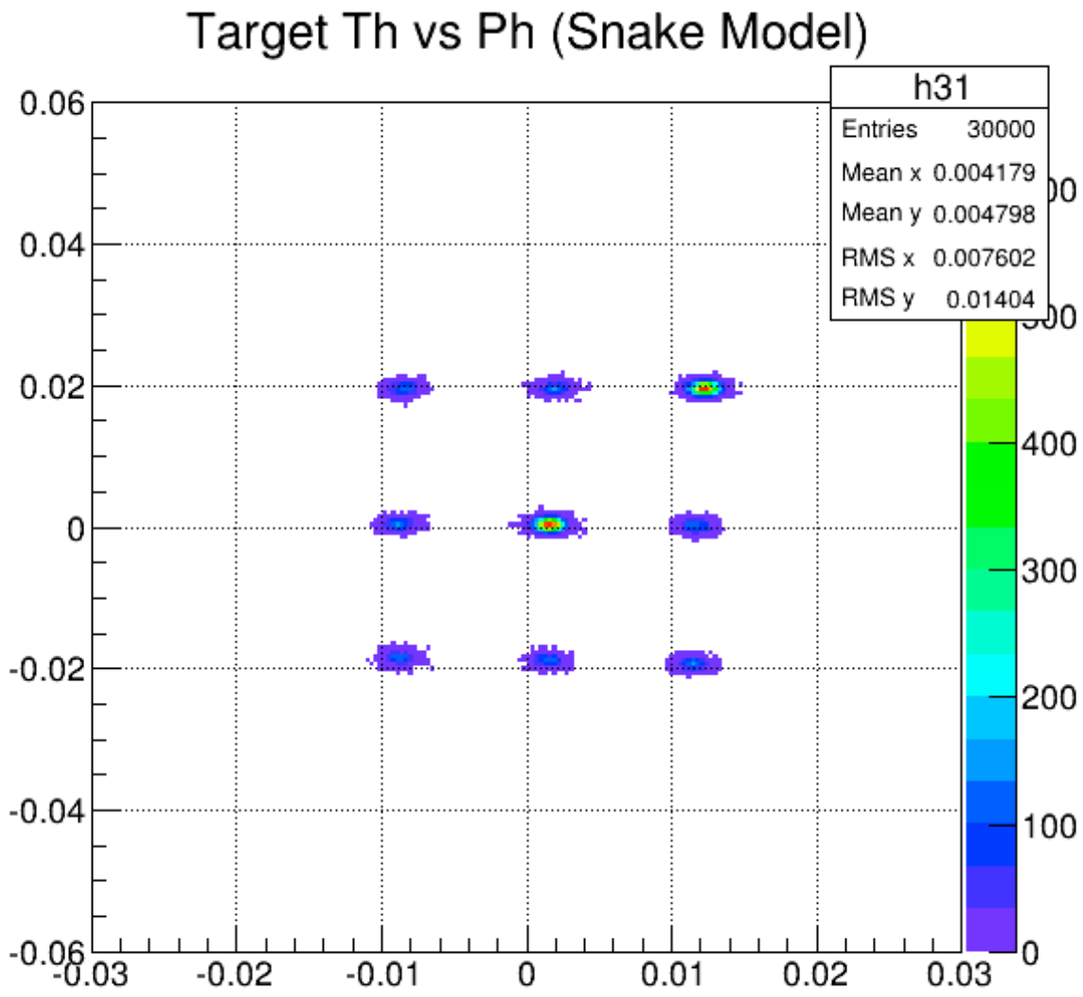
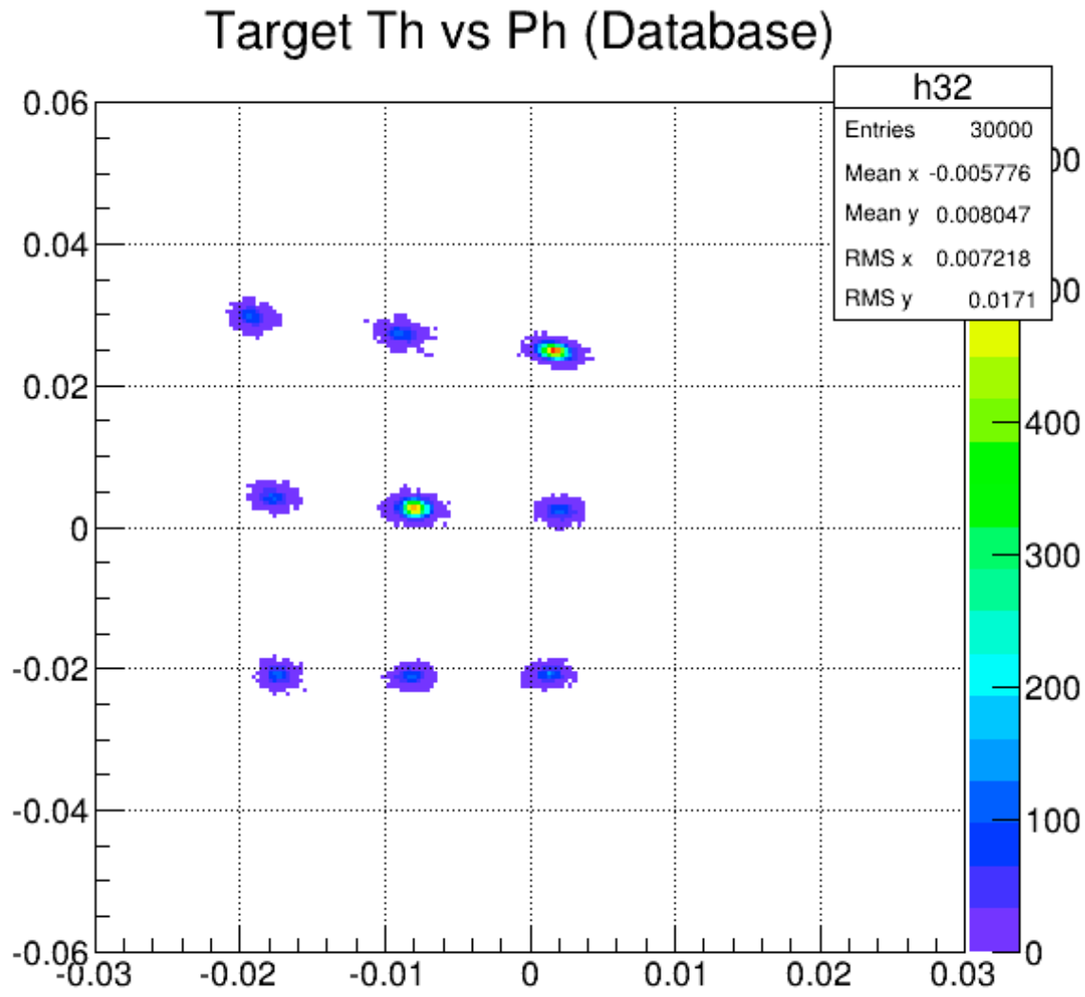
Optics Status

- Simulation:
  - Check first order matrix of SNAKE model and analyzer database

Simulation

- Compare the first order matrix elements
  - Add some coordinate transform to convert the simulation result from Transport Coordinate System to Rotating Coordinate System
  - This makes things better





First Order Matrix

SNAKE:

```
theta_tg =  1.967E-2   x   -2.330      theta
           -2.886E-3   y   -4.511E-2    phi    -1.385E-3
phi_tg   =  4.948E-3   x   -5.233E-2   theta
           -6.645E-1   y   -2.682E-1    phi    +4.577E-3
delta    =  7.454E-2   x   -1.340E-2   theta
           -8.752E-3   y   -5.387E-3    phi    -5.309E-4
```

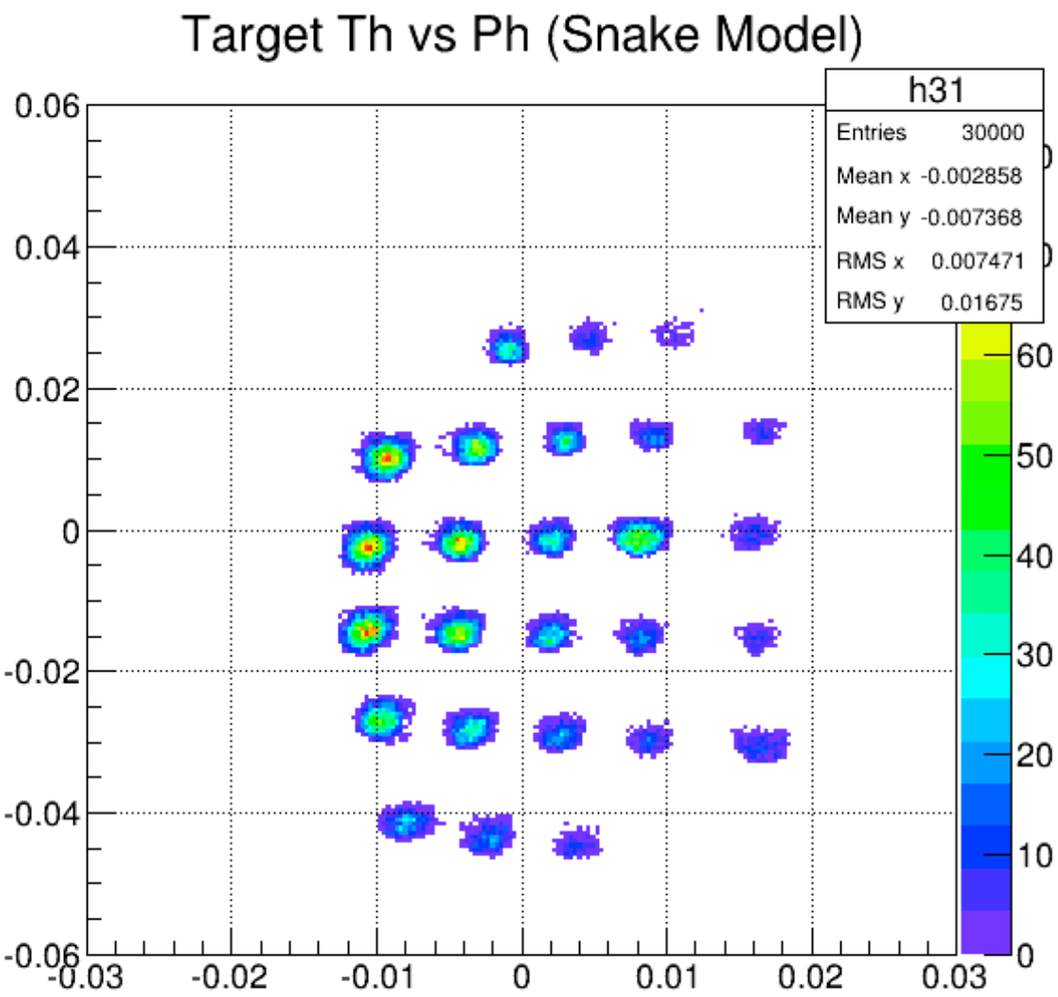
Database:

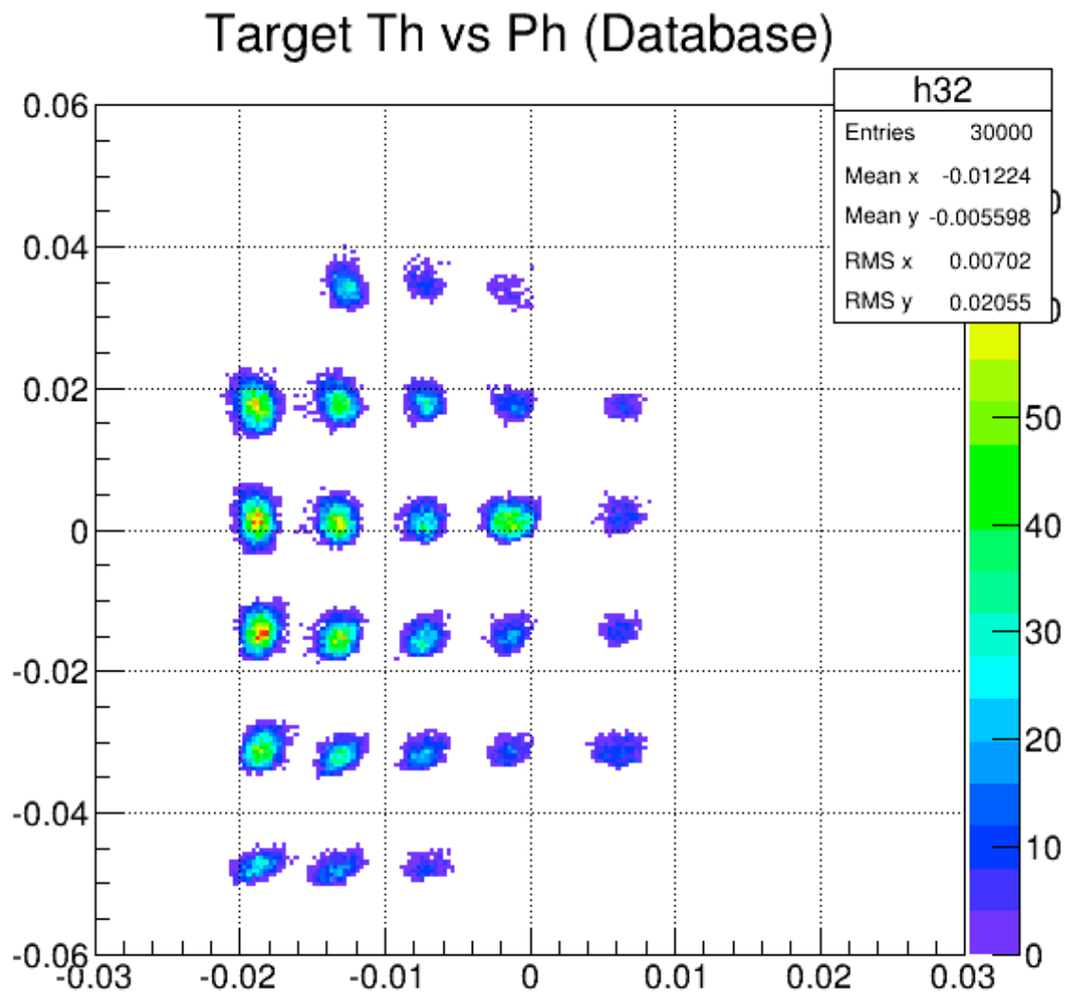
```
theta_tg =  2.531E-2   x   -2.813      theta
           -1.205E-1   y   +1.689E-1    phi    -1.691E-3
phi_tg   =  6.164E-3   x   -1.851E-3   theta
           -6.747E-1   y   +3.182E-1    phi    -4.709E-3
delta    =  7.469E-2   x   -3.060E-2   theta
           -1.254E-2   y   +2.702E-3    phi    -1.092E-4
```

Simulation

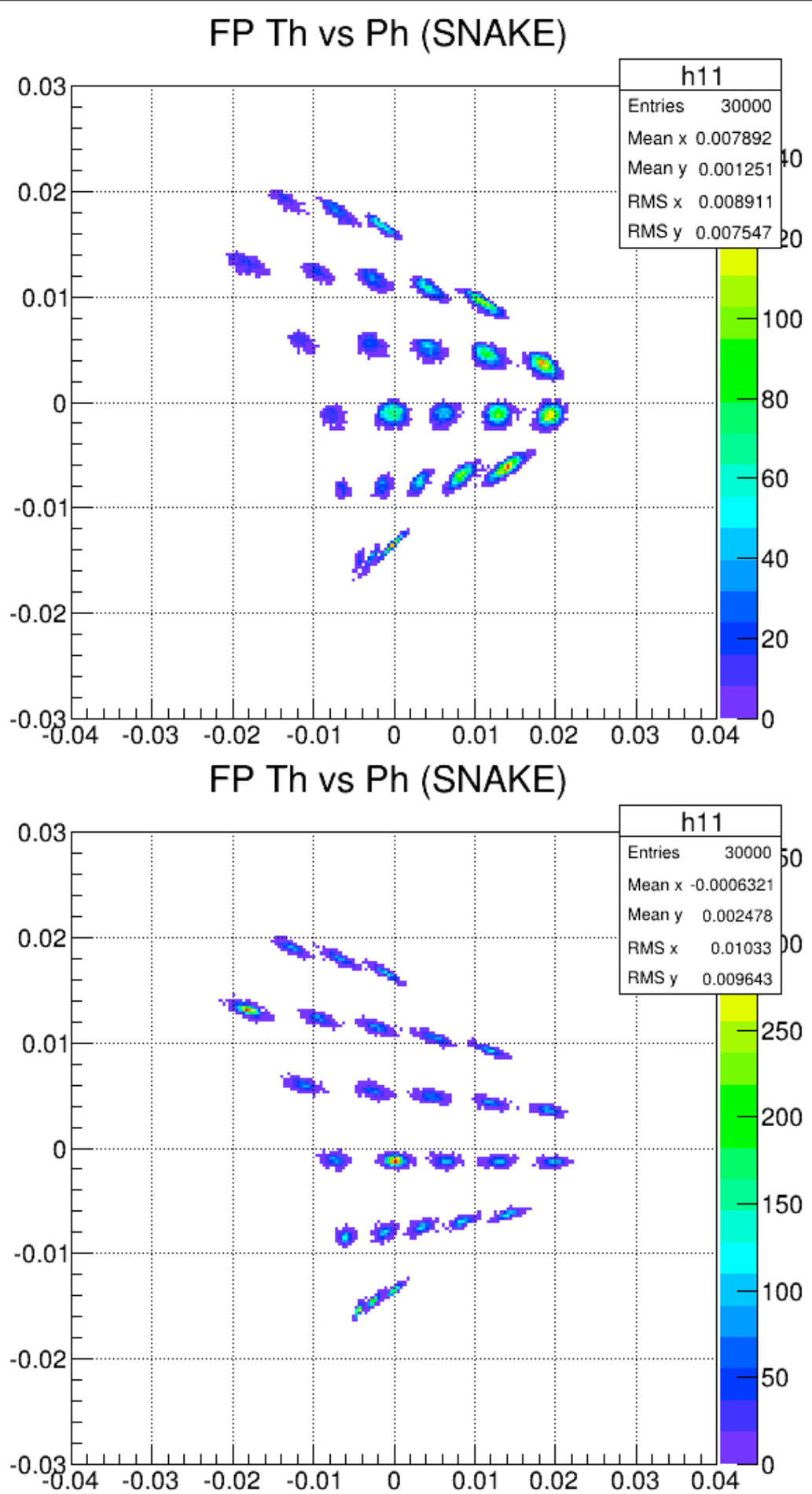
- Compare SNAKE model with real data:
  - Compare both backwards and forwards plots
  - Use 2 source to compare data on focus plane
    - Take the focus plane optics data, calculate the target plane variables of the data with database and then use them to do simulation
    - Directly calculate the scattering angle and momentum of each sieve hole and generate events (Prepare for target field on situation)

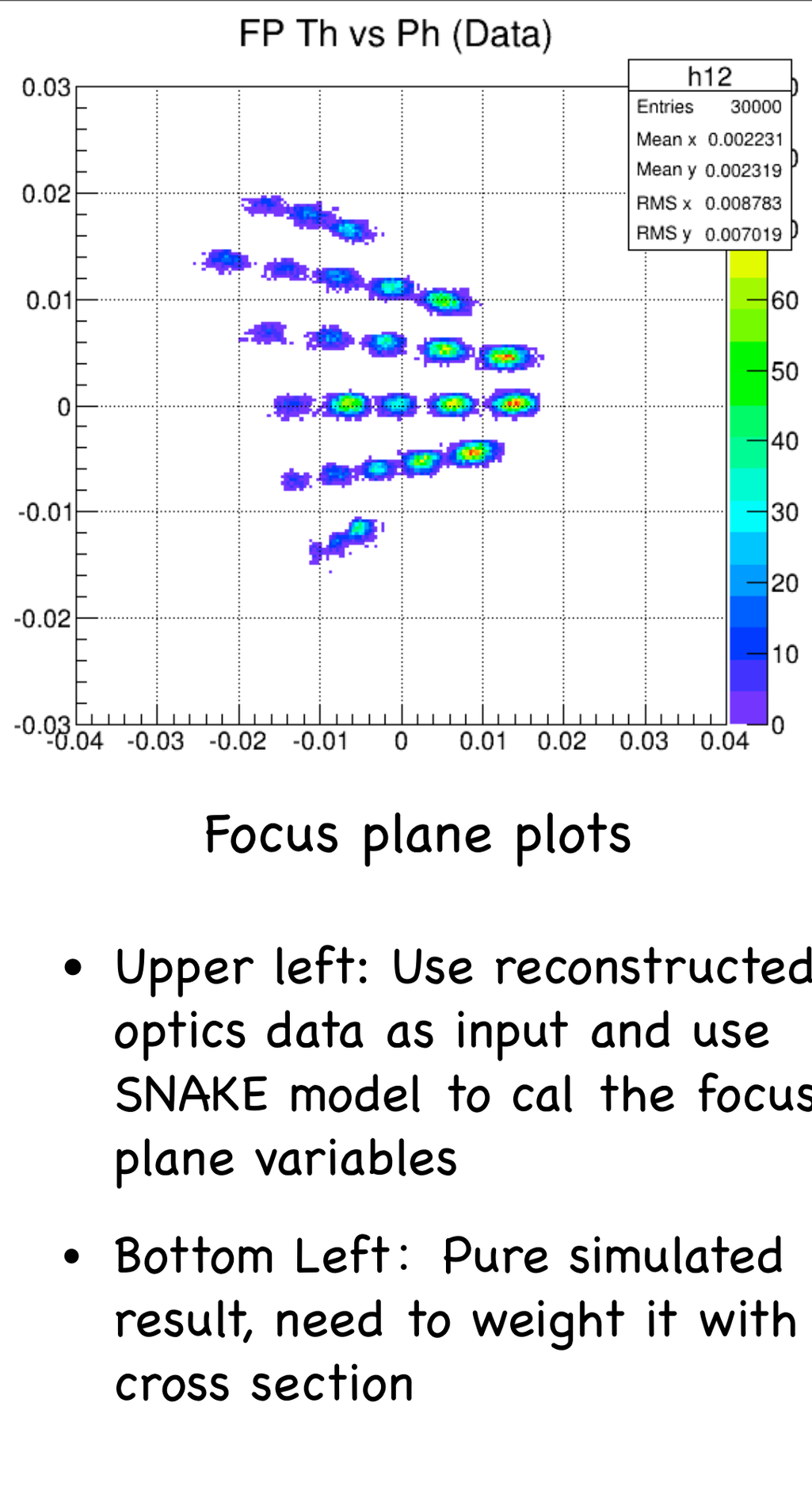
Simulation





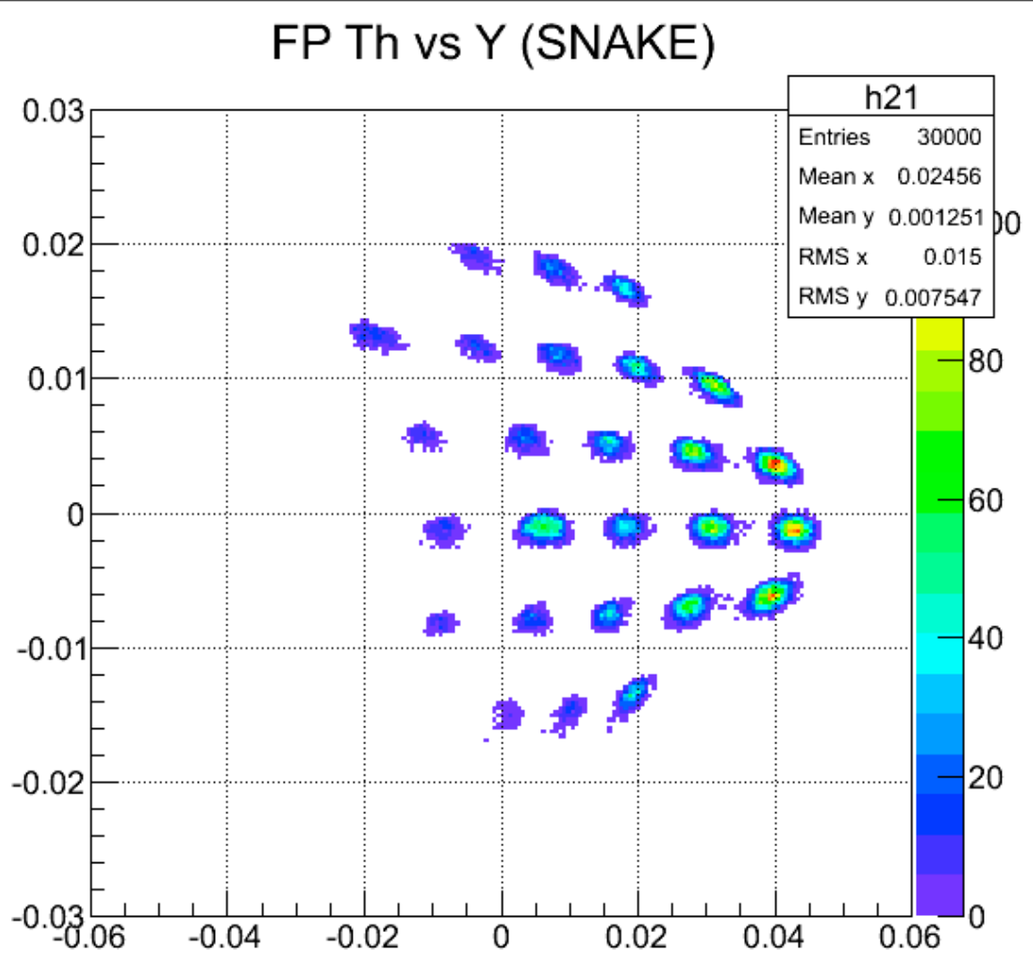
Use both SNAKE and database to reconstruct real optics data

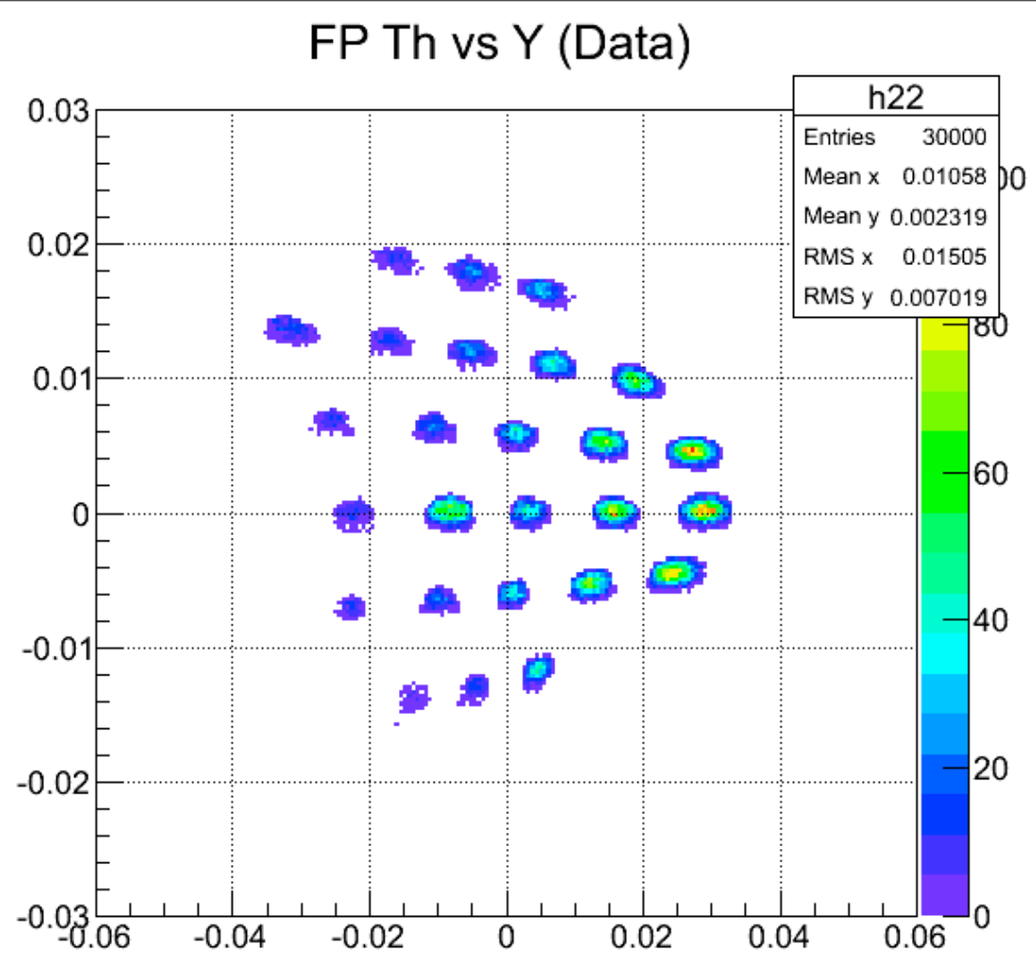


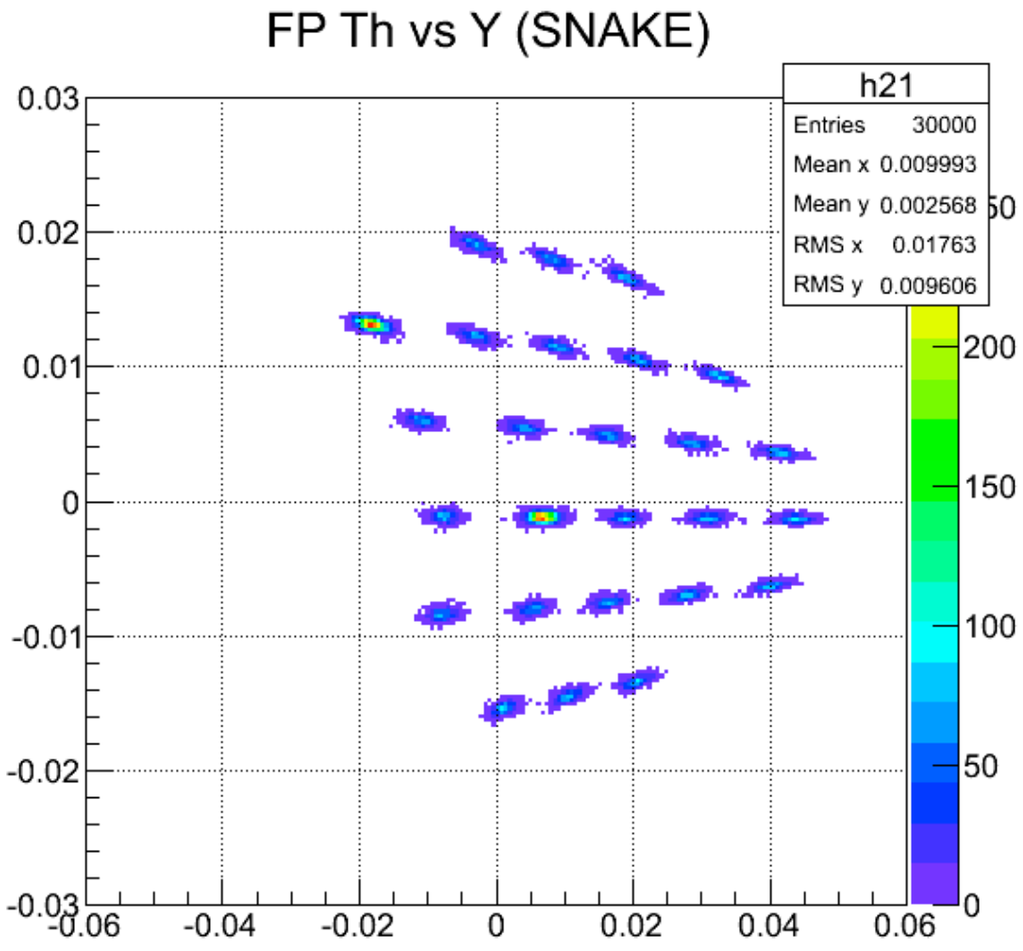


Focus plane plots

- Upper left: Use reconstructed optics data as input and use SNAKE model to cal the focus plane variables
- Bottom Left: Pure simulated result, need to weight it with cross section


FP Th vs Y (SNAKE)
h21
Entries 30000
Mean x 0.02456
Mean y 0.001251
RMS x 0.015
RMS y 0.007547
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
80
60
40
20
0


FP Th vs Y (Data)
h22
Entries 30000
Mean x 0.01058
Mean y 0.002319
RMS x 0.01505
RMS y 0.007019
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
80
60
40
20
0


FP Th vs Y (SNAKE)
h21
Entries 30000
Mean x 0.009993
Mean y 0.002568
RMS x 0.01763
RMS y 0.009606
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
200
150
100
50
0

Optics Status

- TODO:
  - The database optimization need to be tuned
  - Move to the optics data at 484816 septa setting with target field and compare the focus plane plots