

Yields update—beam position issue

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Last time Review

Packing Fraction Runs Yields - E2.2GeV, 2.5T Tran

| Run # | beam energy | material ID | Momentum | Horizontal X (mm) | Ph=dx/dz (mrad) | Vertical Y (mm) | Th=dy/dz (mrad) | Slow Raster X (mm) | Slow Raster Y (mm) | Fast Raster X (mm) | Fast Raster Y (mm) | Yields W/o Cut | Yields w. 6mm Cut | Simulation (6mm size) | Simulation Acceptance |
|-------|-------------|-------------|----------|-------------------|-----------------|-----------------|-----------------|--------------------|--------------------|--------------------|--------------------|----------------|-------------------|-----------------------|-----------------------|
| 3446 | 2253.6 | 8 | 2.228 | 4.6 | 4.2 | 3.4 | 63.6 | 10.3 | 8.9 | 0.8 | 0.8 | 1 | 1 | 1 | 1 |
| 3575 | 2253.6 | 8 | 2.2281 | 2.2 | 1.2 | 0.7 | 60.4 | 8.8 | 7.7 | 0.8 | 0.8 | 1.054 | 1.028 | 0.718 | 0.991 |
| 3759 | 2253.5 | 8 | 2.228 | 1.6 | 0.8 | 2.9 | 61.9 | 7.5 | 6.5 | 0.8 | 0.7 | 1.172 | 1.118 | 0.673 | 0.977 |
| 3865 | 2253.6 | 8 | 2.228 | 1 | 0.8 | 0.6 | 60.9 | 9.2 | 8.1 | 0.8 | 0.8 | 1.134 | 1.132 | 0.649 | 0.982 |

With 6mm raster cuts, yields spread from 17.2% to 13.2%, agree simulation 36.1%

Run3646 Moller Run3575 fire alarm (all magnets down) Run3759 target quench run3865



- ✓ Conclusions:
- ✓ Simulated yields fluctuate much larger than the real yields – bpm best situation
- ✓ Simulated yields even opposite real yields change
- ✓ Possible beam information not correct?

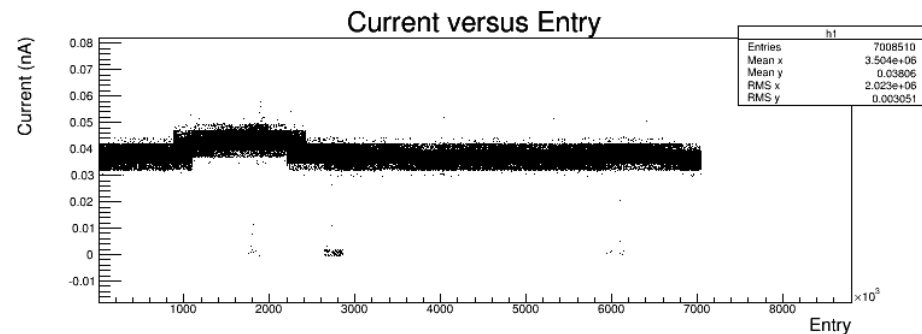
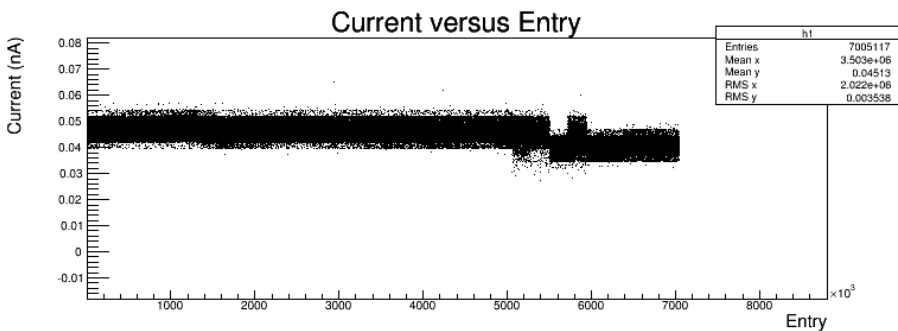
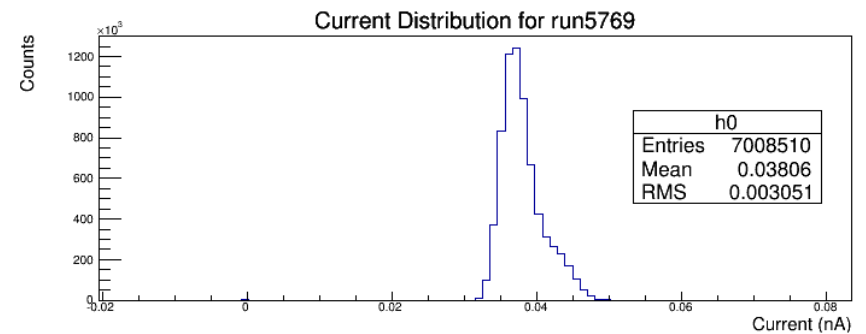
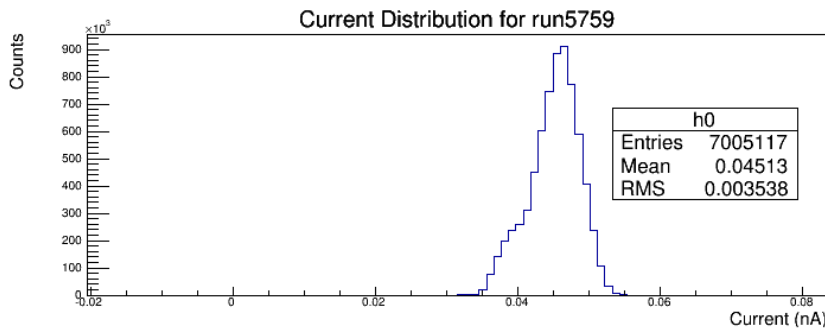
Beam best situation- E2.2GeV, 5T Longitudinal

Firstly, Look at the 2.0497GeV Momentum Settings–Total 66 runs

| Run # | beam energy | material ID | Momentum | Current (nA) | Horizontal X (mm) | Ph=dx/dz (mrad) | Vertical Y (mm) | Th=dy/dz(mrad) | Slow Raster X (mm) | Slow Raster Y (mm) | Fast Raster X (mm) | Fast Raster Y (mm) | Yields W/o Cut |
|-------|-------------|-------------|----------|--------------|-------------------|-----------------|-----------------|----------------|--------------------|--------------------|--------------------|--------------------|----------------|
| 5706 | 2253.4 | 17 | 2.0497 | 37.9879 | 2.2 | 2 | -4.8 | -1.8 | 10.3 | 8.9 | 0.7 | 0.6 | 1 |
| 5707 | 2253.5 | 17 | 2.0497 | 36.1494 | 3 | 2.8 | -4.5 | -1.4 | 10.3 | 8.9 | 0.7 | 0.6 | 1.007 |
| 5708 | 2253.5 | 17 | 2.0497 | 37.7726 | 2.1 | 1.9 | -4.2 | -1.1 | 10.3 | 8.9 | 0.7 | 0.6 | 1.007 |
| 5709 | 2253.6 | 17 | 2.0497 | 48.8587 | -0.3 | -0.6 | -3.7 | -0.6 | 10.3 | 8.9 | 0.7 | 0.6 | 0.993 |
| 5710 | 2253.2 | 17 | 2.0497 | 43.5904 | 0.3 | 0 | -4.3 | -1.3 | 10.3 | 8.9 | 0.7 | 0.6 | 0.994 |
| 5711 | 2253.6 | 17 | 2.0497 | 35.5308 | 3.3 | 3.3 | -4.4 | -1.4 | 10.3 | 8.9 | 0.7 | 0.6 | 1.004 |
| 5712 | 2253.1 | 17 | 2.0497 | 34.8821 | 3.6 | 3.4 | -4.4 | -1.4 | 10.3 | 8.9 | 0.7 | 0.6 | 1.015 |
| 5713 | 2253.1 | 17 | 2.0497 | 45.1547 | 0.2 | -0.1 | -4.3 | -1.1 | 10.3 | 8.9 | 0.7 | 0.6 | 1.001 |
| 5714 | 2253.5 | 17 | 2.0497 | 45.5989 | -0.2 | -0.5 | -4 | -0.9 | 10.3 | 8.9 | 0.7 | 0.6 | 0.998 |
| | | | | | ... | | | | | | | | |
| | | | | | ... | | | | | | | | |
| | | | | | To run 5777 | | | | | | | | |

Beam best situation- E2.2GeV, 5T Longitudinal

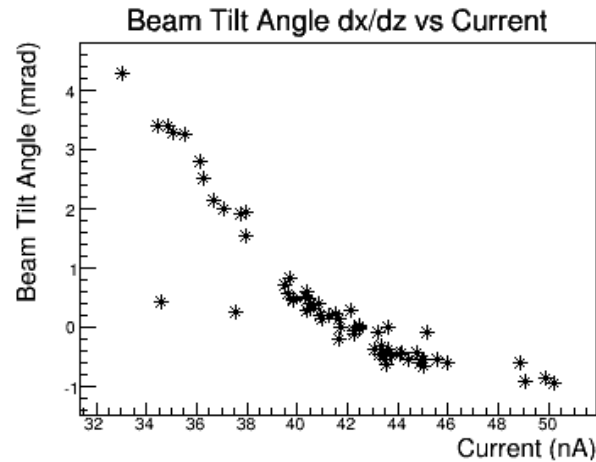
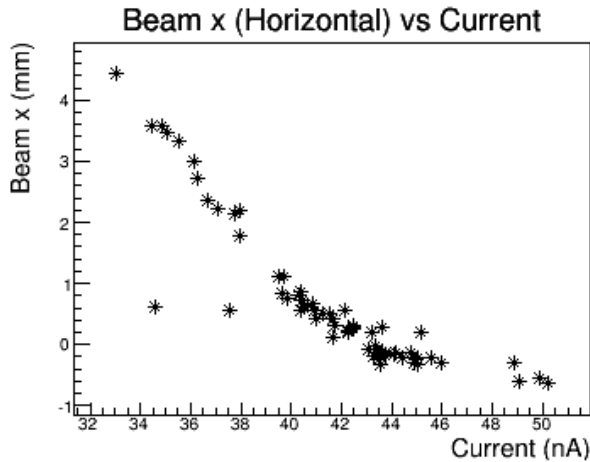
Secondly, Look at the calibrated current for two random runs



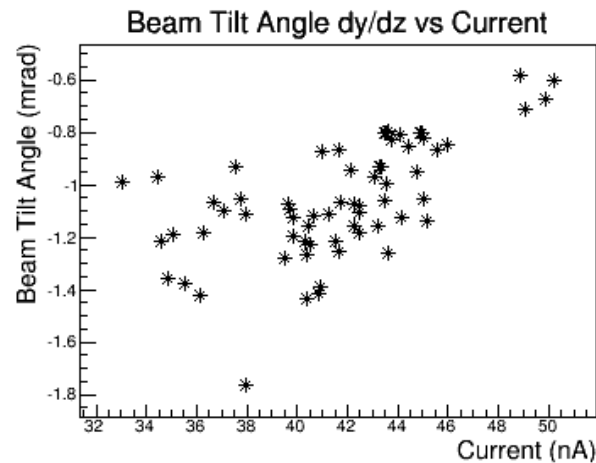
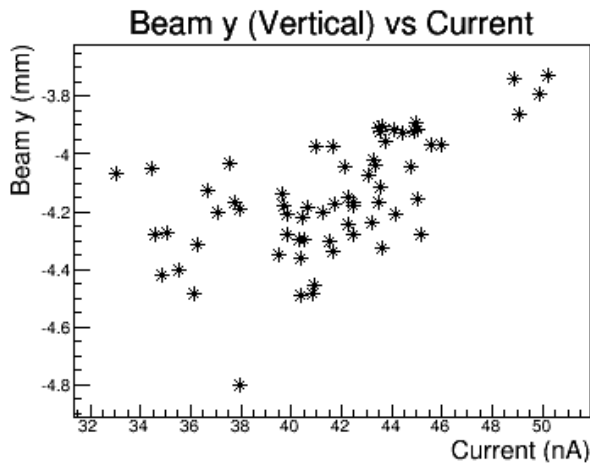
Continuous taking data between these two runs
Can beam current changes so much?

Beam best situation- E2.2GeV, 5T Longitudinal

Thirdly, Look at the calibrated beam information versus current



Strong Linear Correlation



But beam current Change run by run randomly

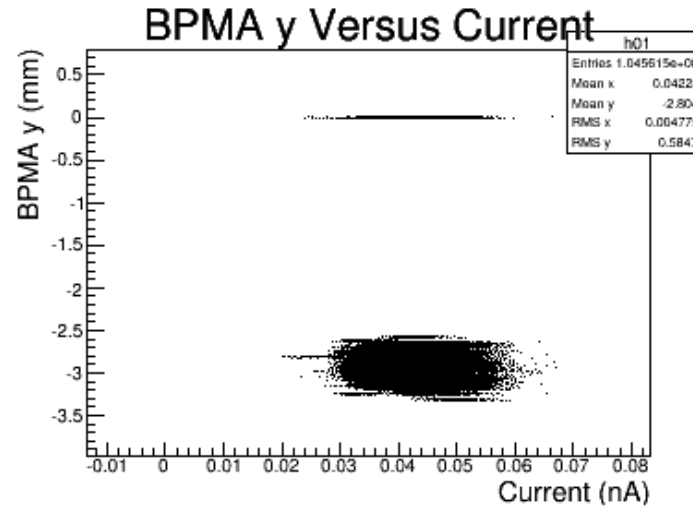
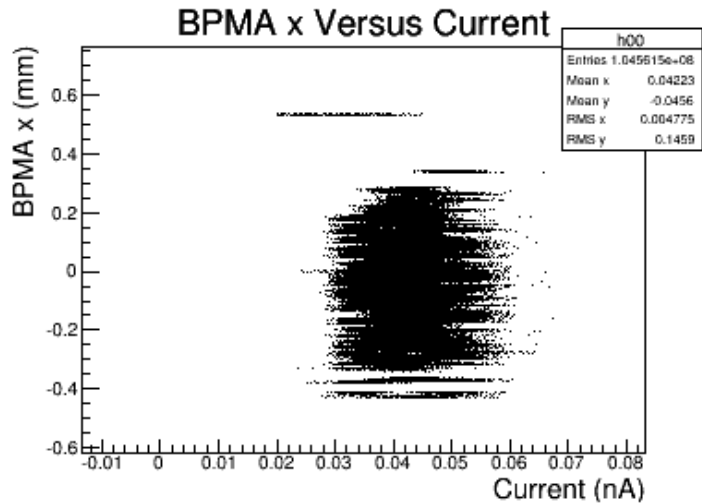
Beam best situation- E2.2GeV, 5T Longitudinal

Fourthly, Look at online beam information

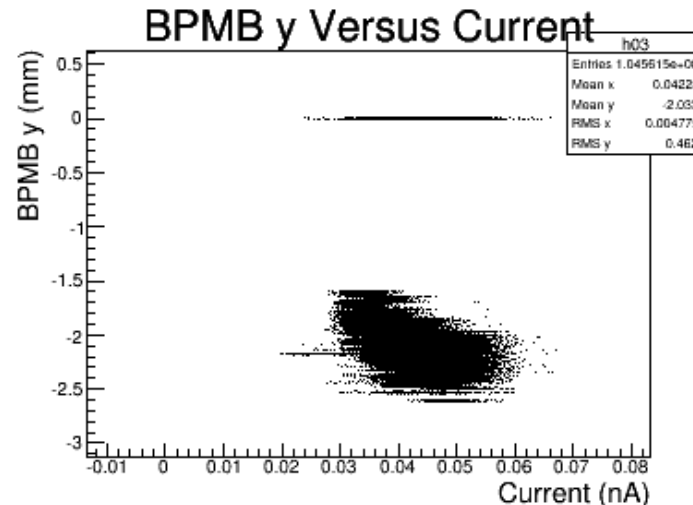
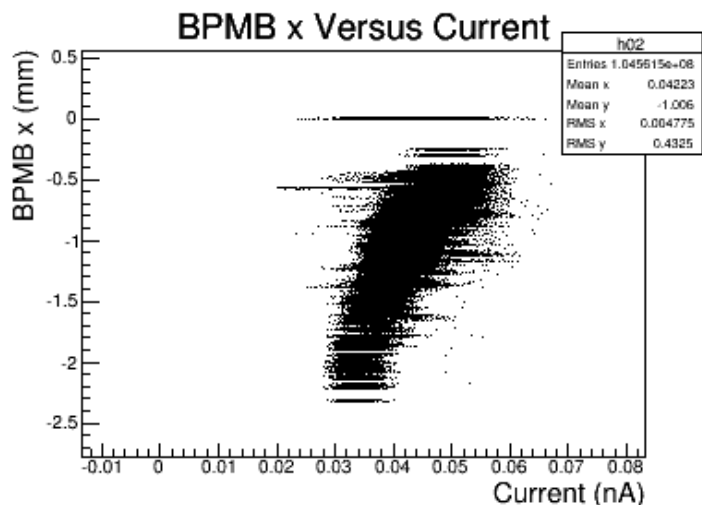


Beam best situation- E2.2GeV, 5T Longitudinal

Fourthly, Look at online beam information



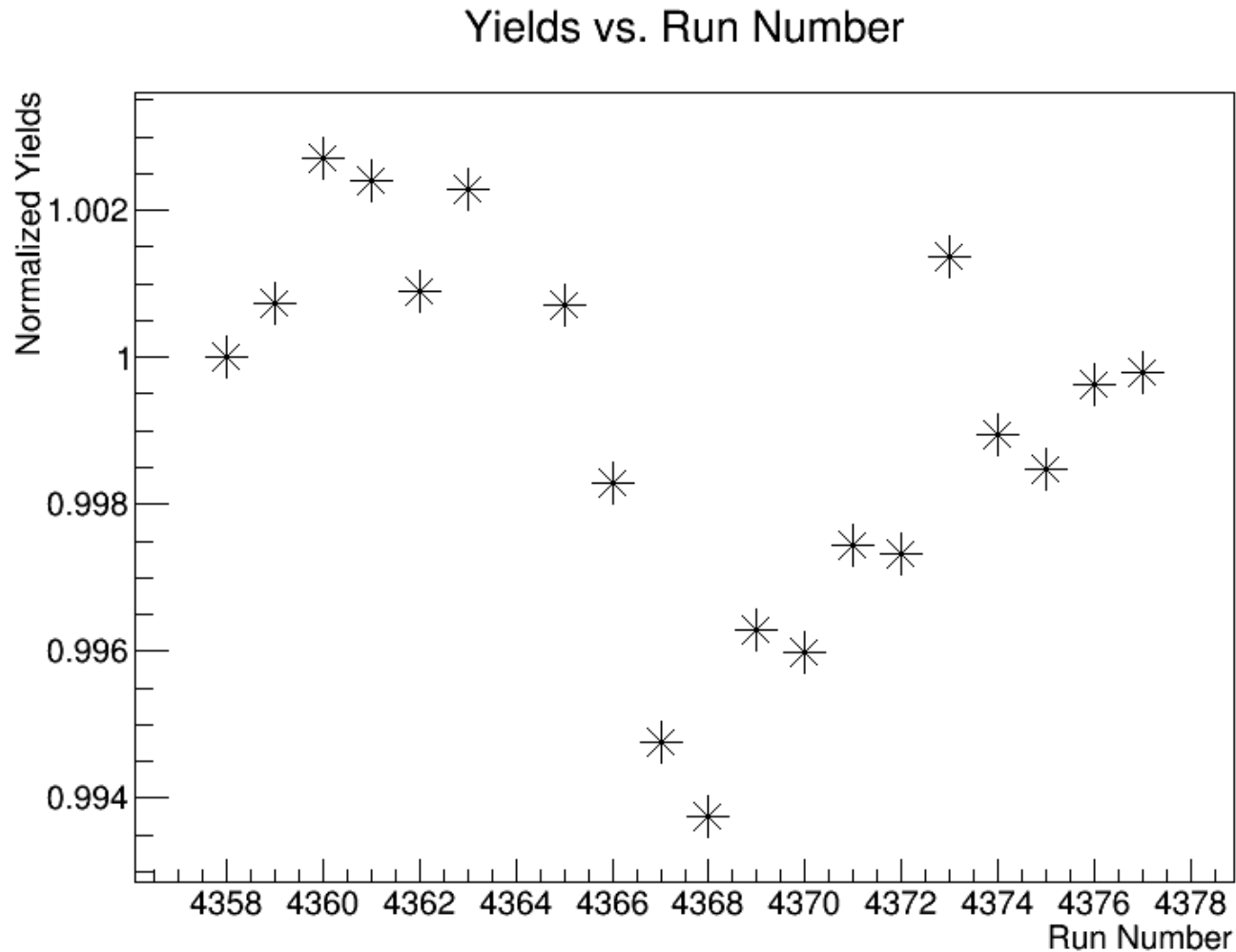
Strong Linear
Correlation
For BPMB



But not BPMA
So BPMB have
Current
Dependence?

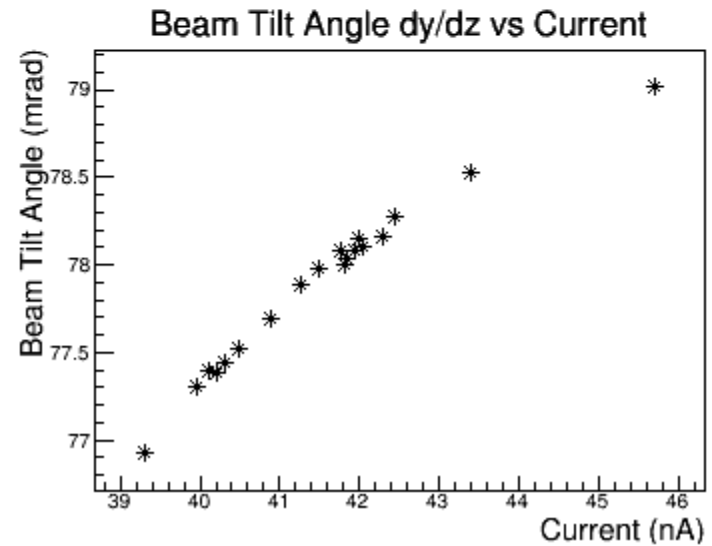
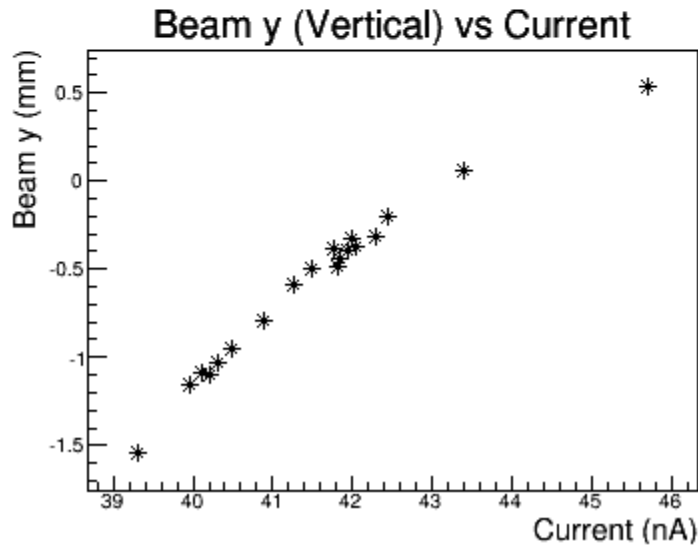
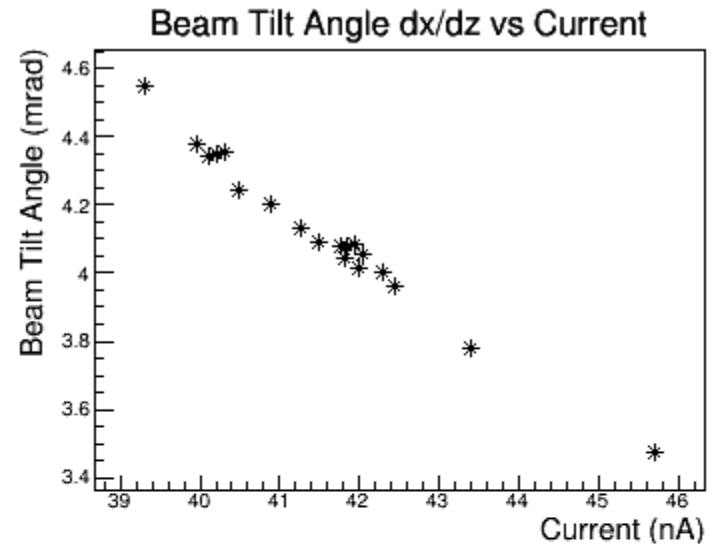
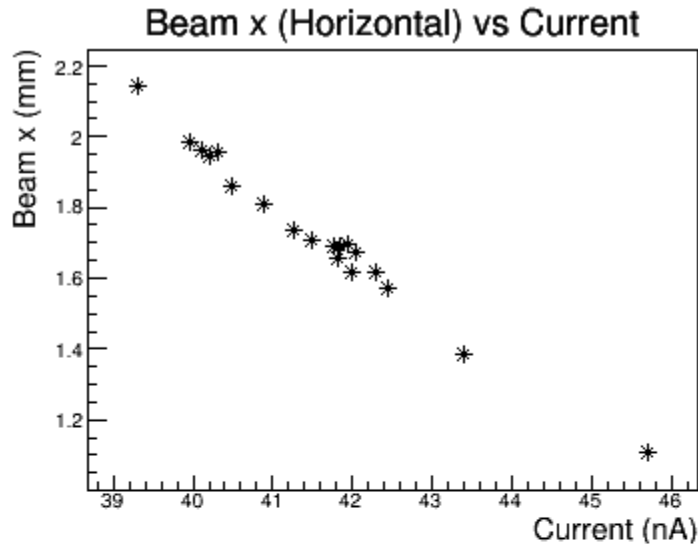
Setting Without Yield Drift- E1.7GeV, P1.2GeV

Also, Look at setting without yields drift, which means the beam is probably stable



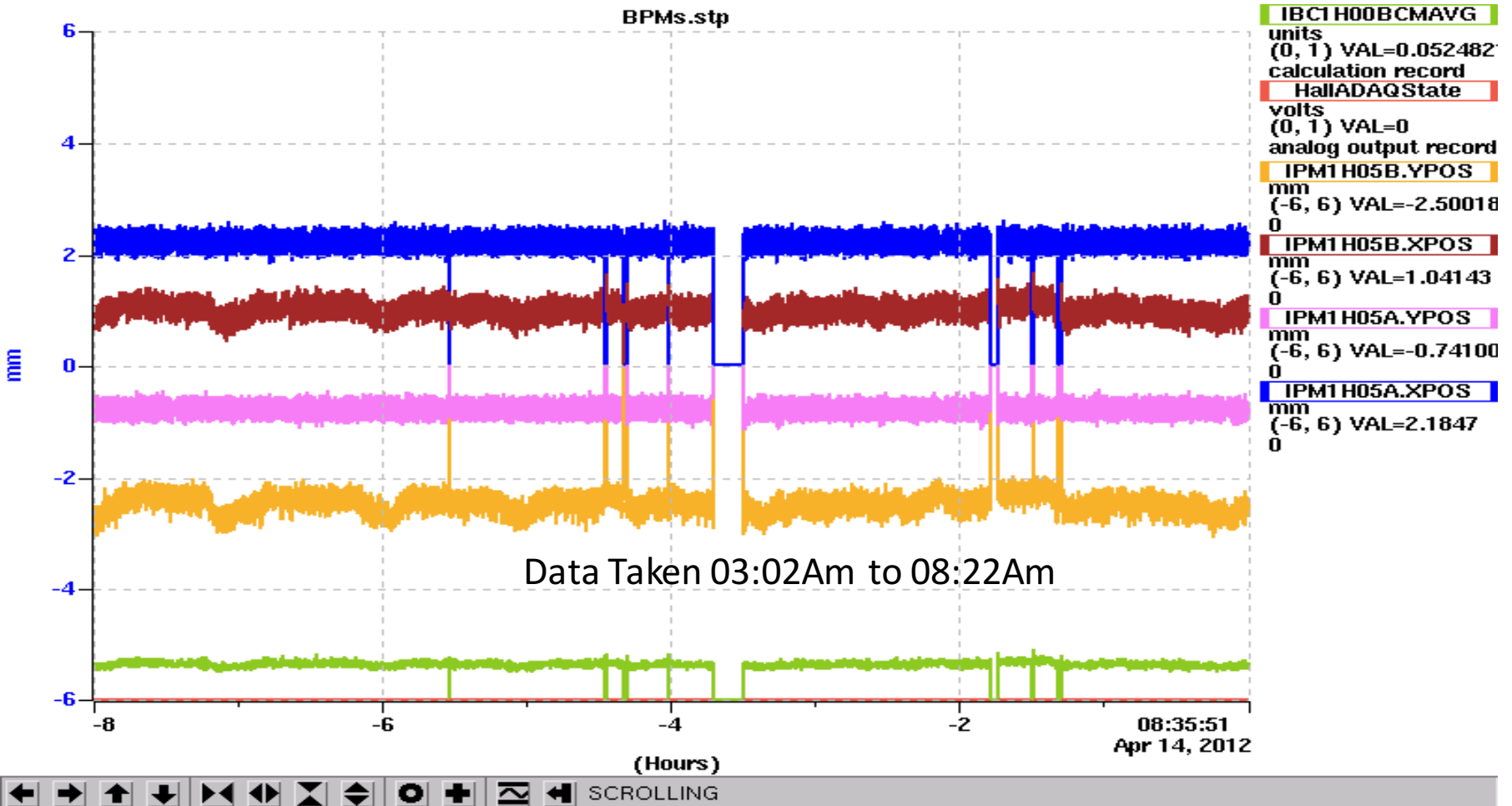
Yields spread within 1%

Setting Without Yield Drift- E1.7GeV, P1.2GeV



Setting Without Yield Drift- E1.7GeV, P1.2GeV

Look at online beam information



Summary

- Most of production runs have this issue: current versus beam
- This effects is stronger when current <40 nA
- Very big uncertainty for beam information can exist if not corrected, eg 5mm for p2.0GeV longitudinal setting
- Setting without yields drift may help to study the relation between current and beam, assume real beam not drift