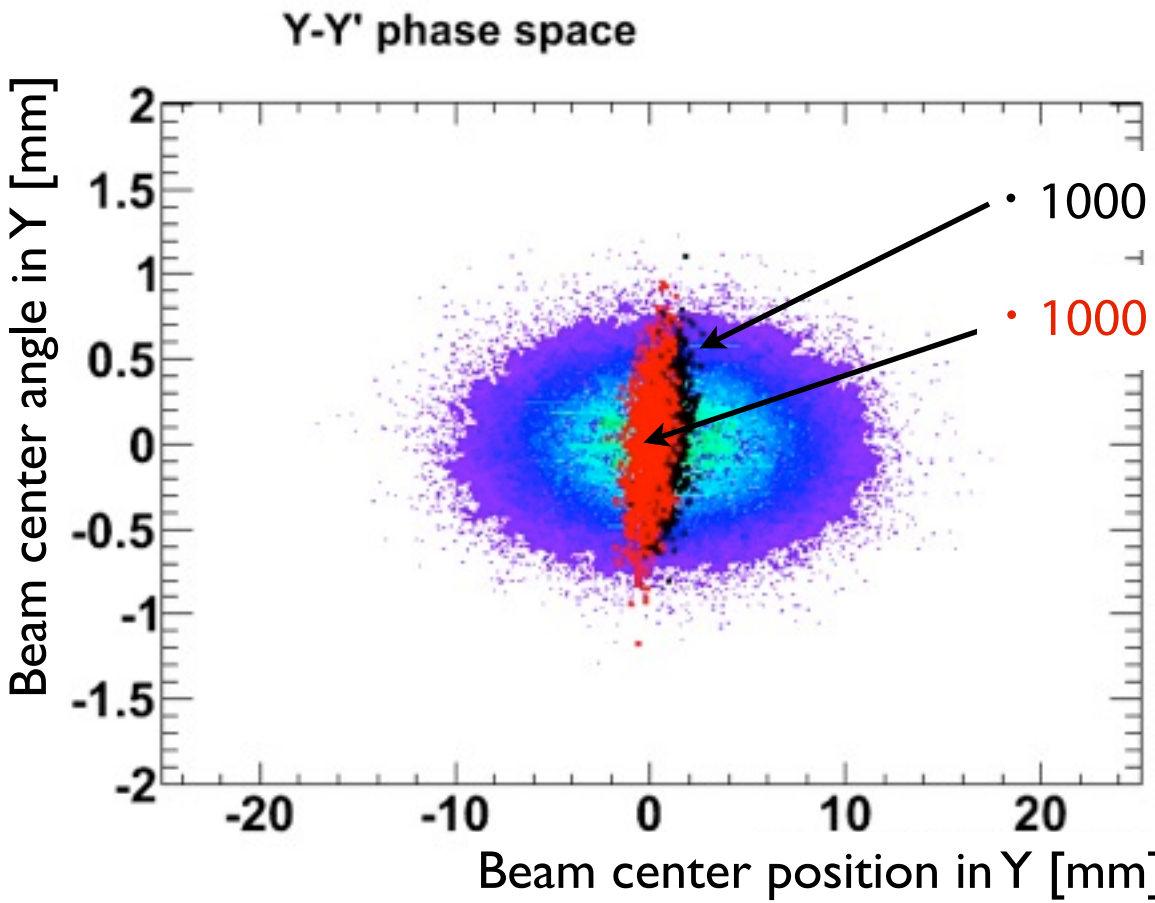
Update of flux systematic error

Update for flux uncertainty from proton beam & beam direction (off-axis angle)

- Update for flux uncertainty from proton beam (p-beam) → more detail in p.3
  - The current uncertainty estimated by only Run1 p-beam uncertainty.
  - It is going on to estimate of flux uncertainty by using Run2 uncertainty w/ the same method as estimation for Run1.
- Update for flux uncertainty from beam direction (off-axis angle) → more detail in p.4
  - The current uncertainty estimated by only RunI data → estimated by each Run period data.
- (Personal) time schedule : finalize at Dec. analysis meeting.

Analysis status (proton beam)

- Make throwing samples of p-beam parameter varied within p-beam uncertainty and do reweighting flux → Estimate flux uncertainty.



・1000 throwing by Run1 p-beam parameters.

・1000 throwing by Run2 p-beam parameters

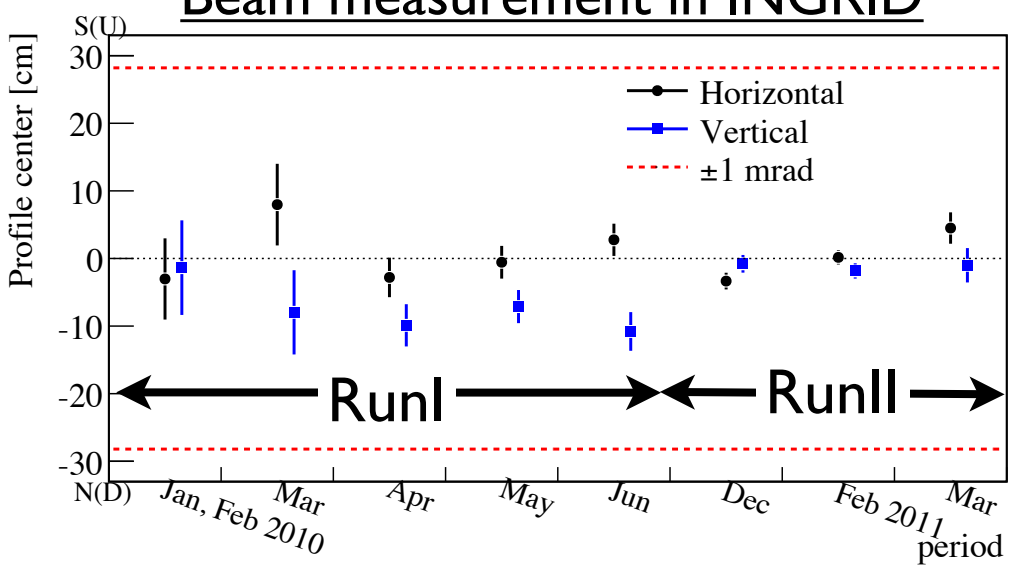
Other dots : using flux made with wide p-beam parameter

→ Large Y-angle variation compared to reweighted wide p-beam flux.
Plan to discard large Y-angle (>2σ), or to make flux with larger p-beam Y-angle.

Analysis status (beam direction)

- Consider the following factor to estimate flux uncertainty from beam direction.
  - The deviation of beam direction from beam-axis
  - Stat. error of beam direction
  - Beam direction uncertainty from INGRID detector syst. error.
- Reviewing the current error estimation by Matsuoka-san and am estimating the beam direction uncertainty measured with INGRID for each Run period.

Beam measurement in INGRID



Beam summary in INGRID

Beam center from the INGRID center	X center[cm]	Y center[cm]
RUN1 + RUN2	-0.4 ± 0.7 ± 9.2	-3.0± 0.7 ± 10.4
RUN1 only	0.4 ± 1.4 ± 9.2	-8.6± 1.5
RUN2 only	-0.7± 0.8 ± 10.4	-1.4± 0.8

More precise prediction when estimate by each Run period.

Back up

- Proton beam parameters & uncertainty

Proton beam parameters & uncertainty in RunI,II

Proton beam parameter

Table 1. Primary beam optics parameter for Run I

	center position (cm)	center angle (mrad)	profile width (RMS)(cm)	emittance (π mm.mrad)	Twiss parameter α
X	-0.037	0.044	0.4273	2.13	0.60
Y	0.084	0.004	0.4167	2.29	-0.09

Table 2. Primary beam optics parameter for Run2.

	center position (cm)	center angle (mrad)	profile width (RMS)(cm)	emittance (π mm.mrad)	Twiss parameter α
X	-0.0149	0.080	0.4037	5.27	0.16
Y	-0.0052	-0.007	0.4083	5.17	0.14

Uncertainty

	Run I	Run II
width in X (mm)	0.11	0.26
width in Y (mm)	0.97	0.82
Twiss α in X	0.32	0.26
Twiss α in Y	1.68	0.49
position in X(mm) (x)	0.38	0.27
position in Y(mm) (y)	0.58	0.62
angle in X (mrad) (x')	0.056	0.064
angle in Y (mrad) (y')	0.286	0.320
cov(x, x')	0.011	0.013
cov(y, y')	0.065	0.079

TN054(v2.3)