Beam summary in MR Run41

A.Murakami for beam group

Data set

- check the beam quality in physic beam operation
  - Used Data : run# ~410079
    - Spills selected based on run type = “physics”
- 3 kinds of horn current setting in this period
  - 250kA : run# 410052, 410053
  - 200kA : run# 410074~410079
  - 0kA : run# 410065~410068
- Check beam quality for these beam data.
  - After that, apply good spill selection for all.

Spill selection

Quick beam summary

1. Physics run
   - "run_type" is "physic run" and all Horn ON
   - exclude spills for beam tuning, beam study
2. TriggerFlag is "Beam Trigger" (beam during MR operation)
3. Good GPS status
4. CT05 # of protons per spill > 1e11 in order to exclude spills which no beam in MR (due to machine interlock etc...)
5. Normal condition cut
   - exclude unusable spills (e.g. PV2 magnet unstable etc...)
6. Horn current cut
   - Nominal current ± 5 kA for all three horns

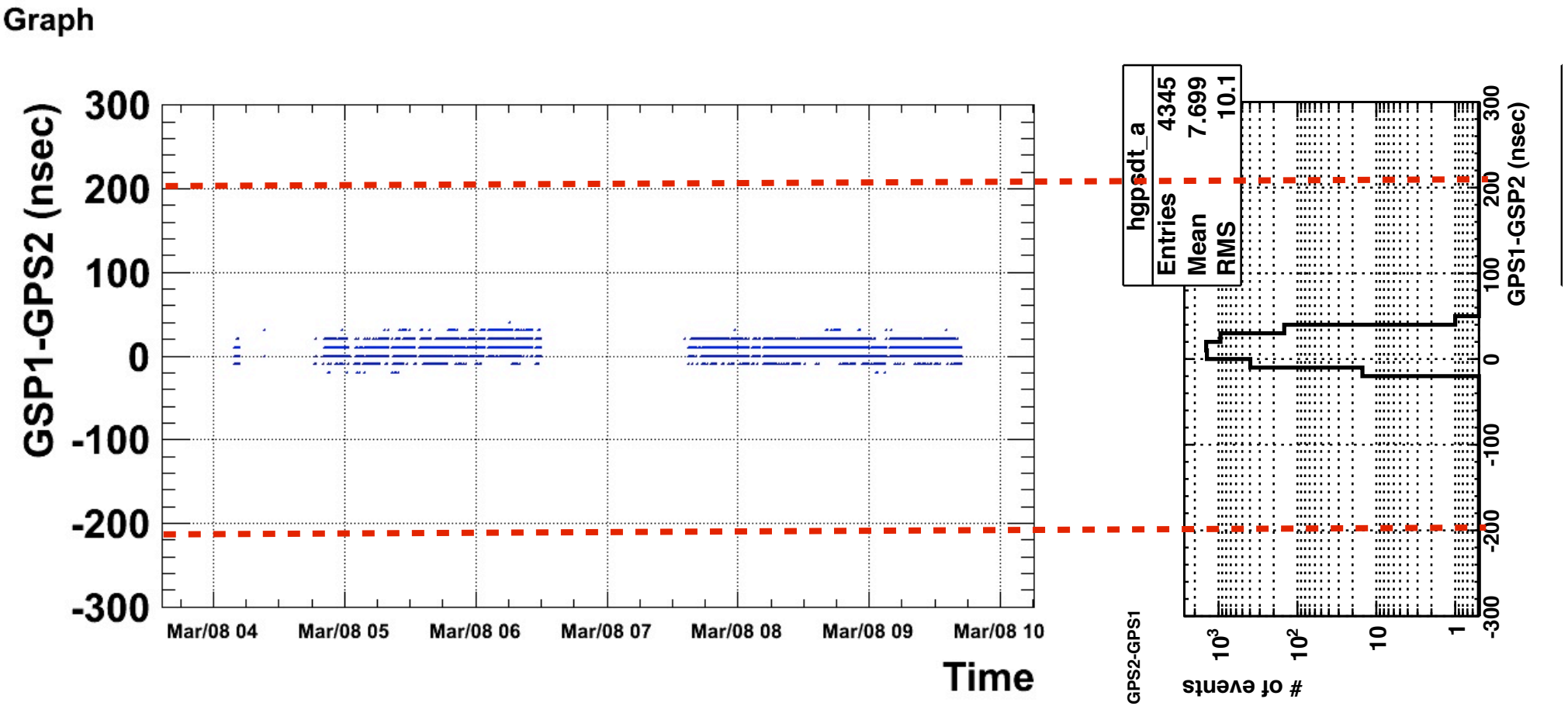
Beam summary

7. MUMON cut
   - beam angle within 1mrad (|Si fit X|<10cm & |Si fit Y|<10cm)
   - Si total Q / CT05 cut : mean of Q/CT05 ± 5%

Horn current : 0kA

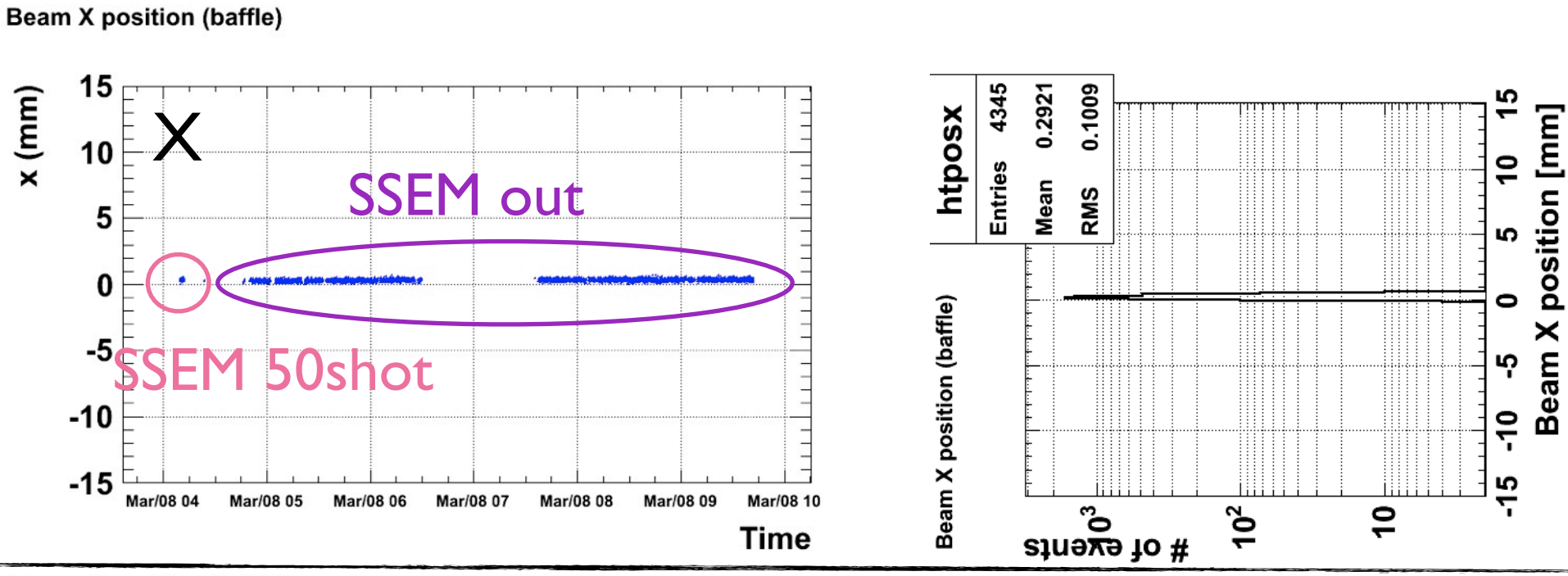
- Run# of used beam data : 410065~410068
  - # of Spills in this period : 4460

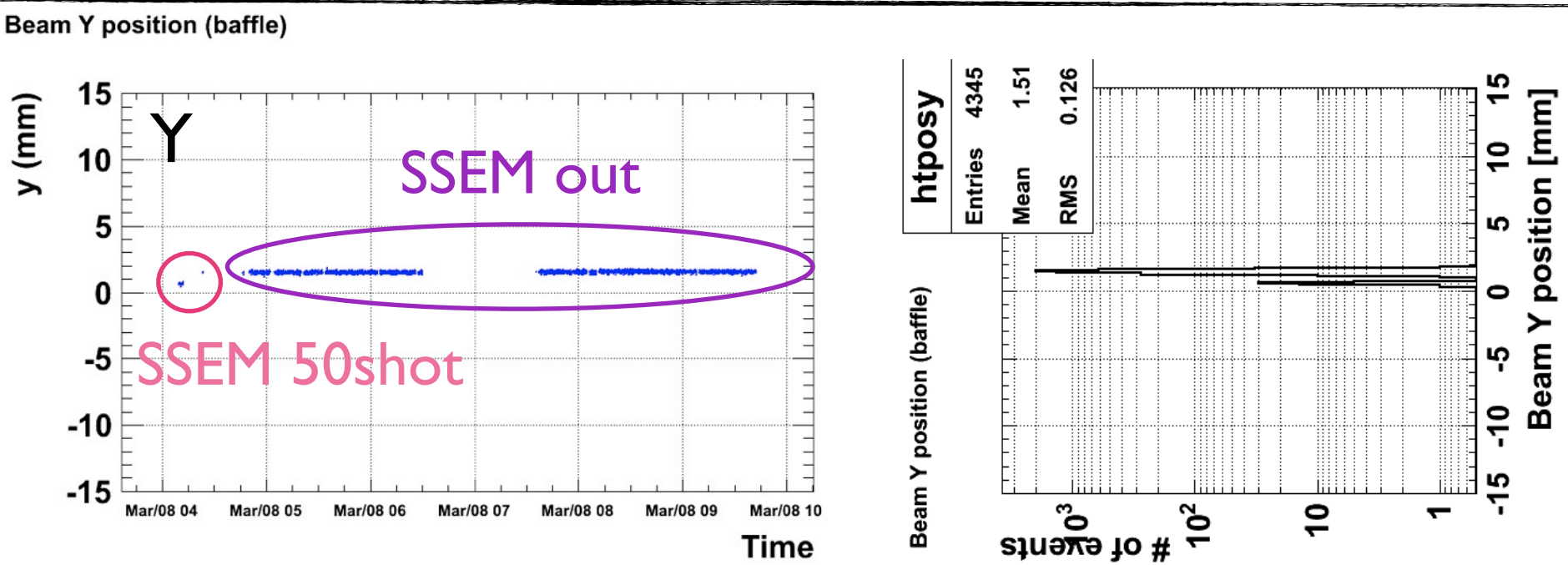
GPS Status



No spills of bad GPS status for 2 GPS recvs

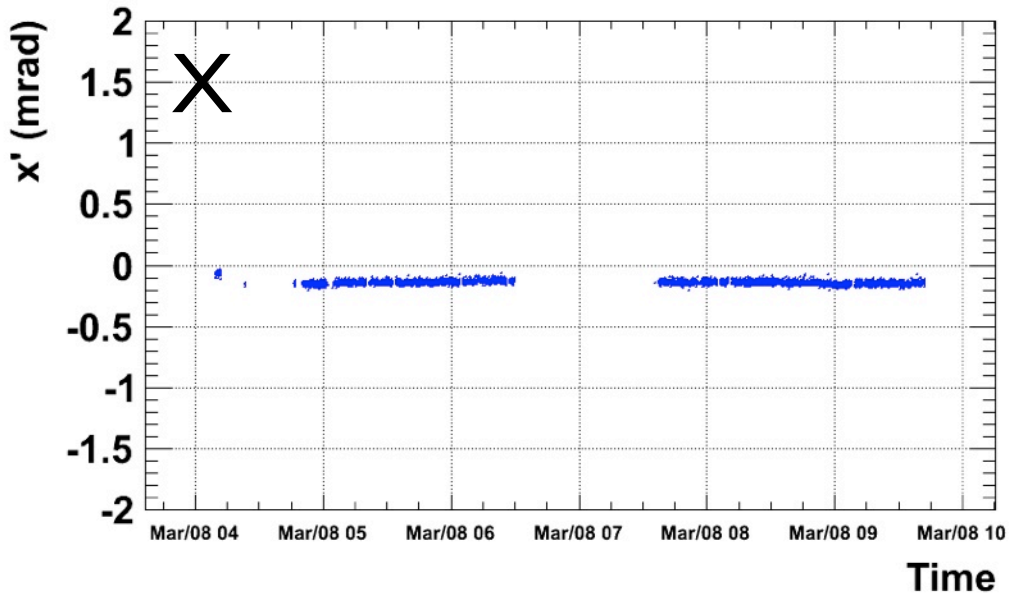
Pbeam center pos

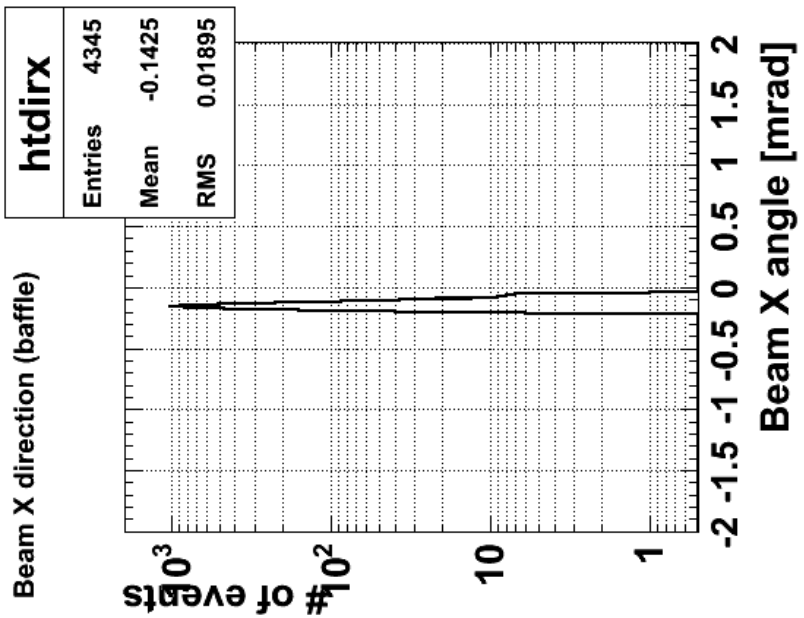




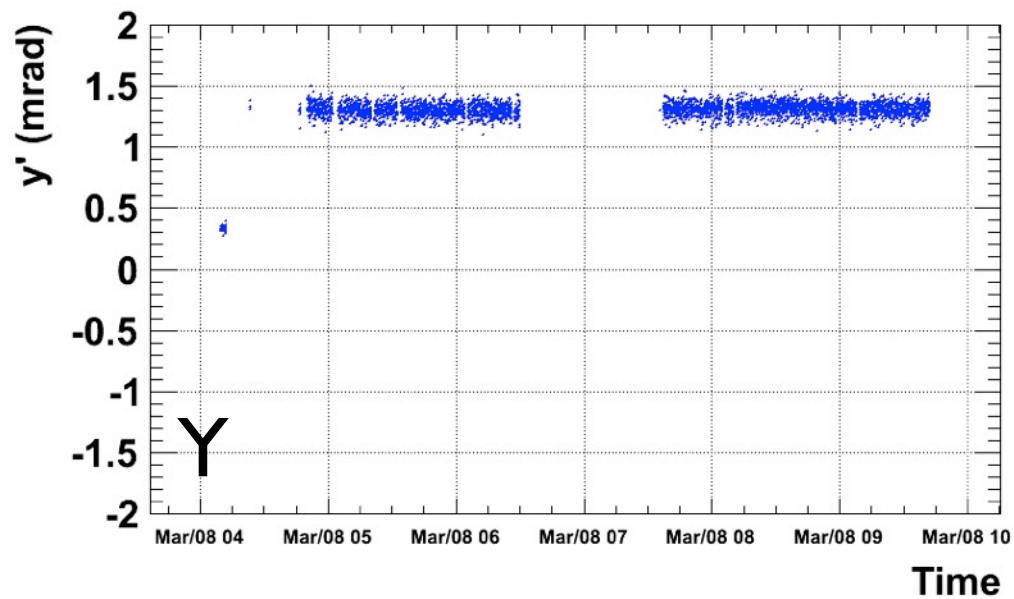
Pbeam center angle

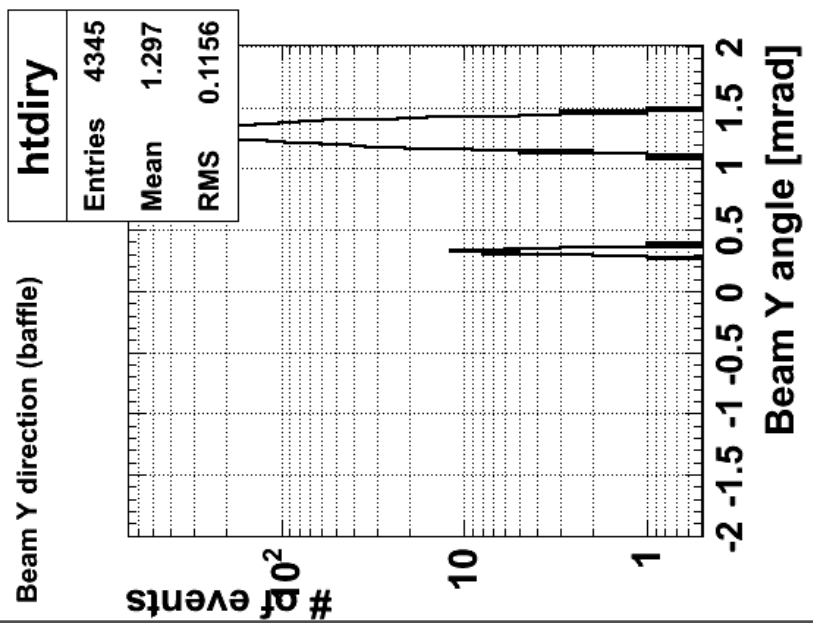
Beam X direction (baffle)



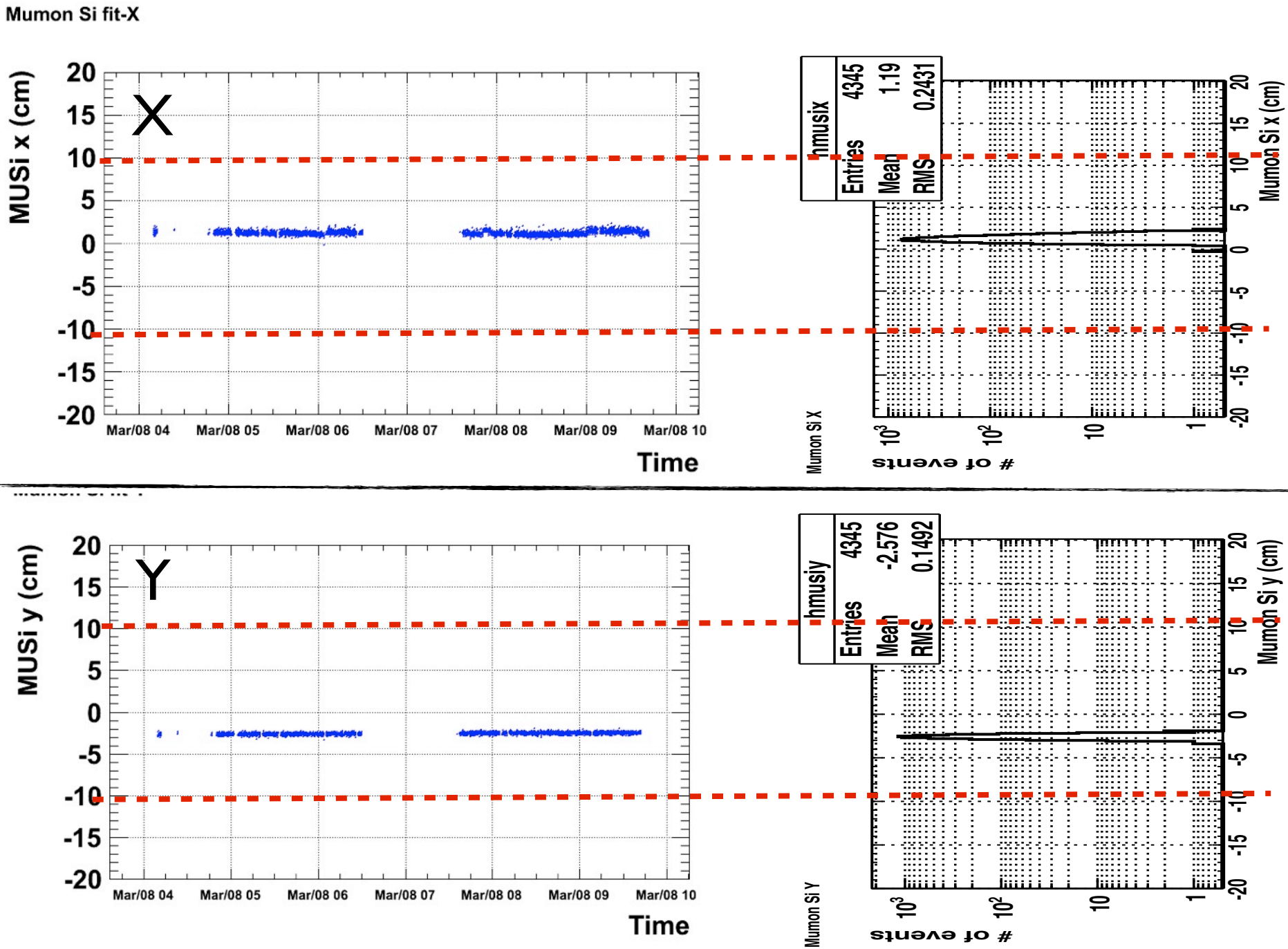


Beam Y direction (baffle)

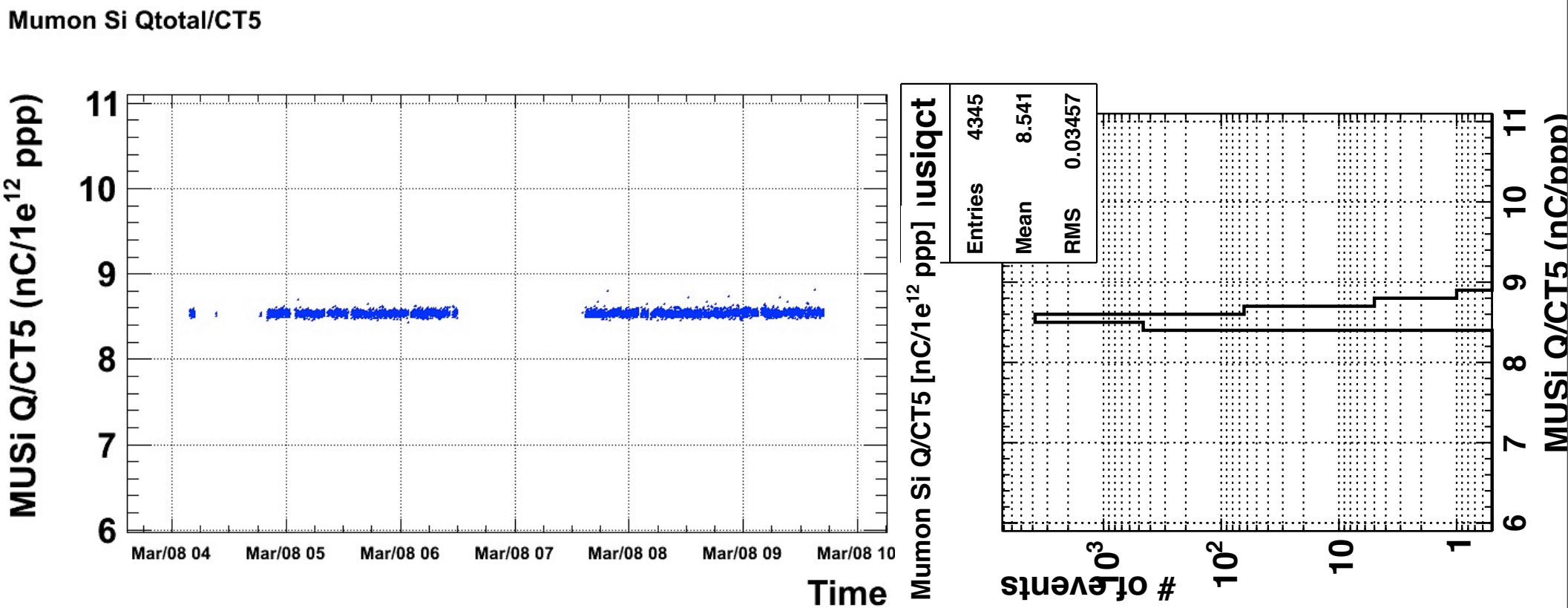




MUMON Si fit center



MUMON Si Q / CT05

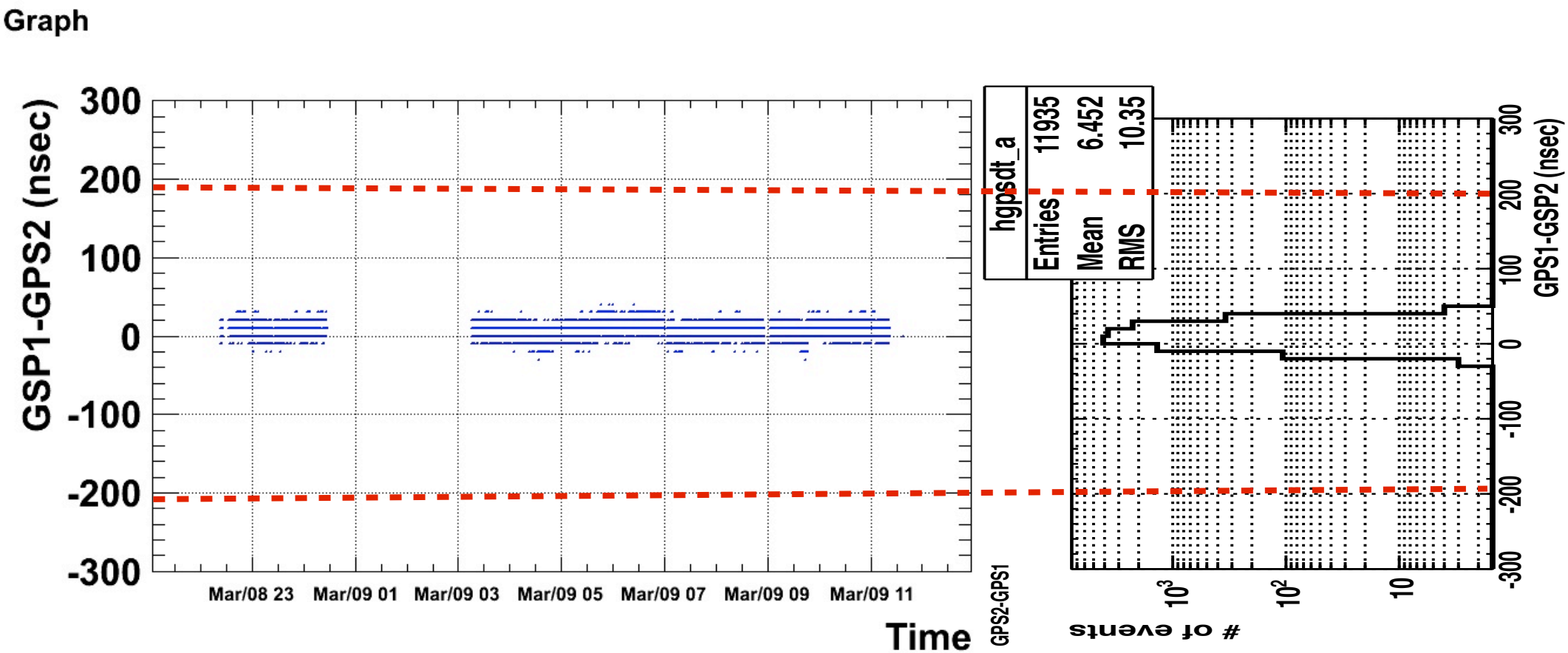


Si Q / CT05 cut = 8.11~8.97

Horn current 200kA

- Run# of used beam data : 410074~410079
  - # of spills in this period : 11973

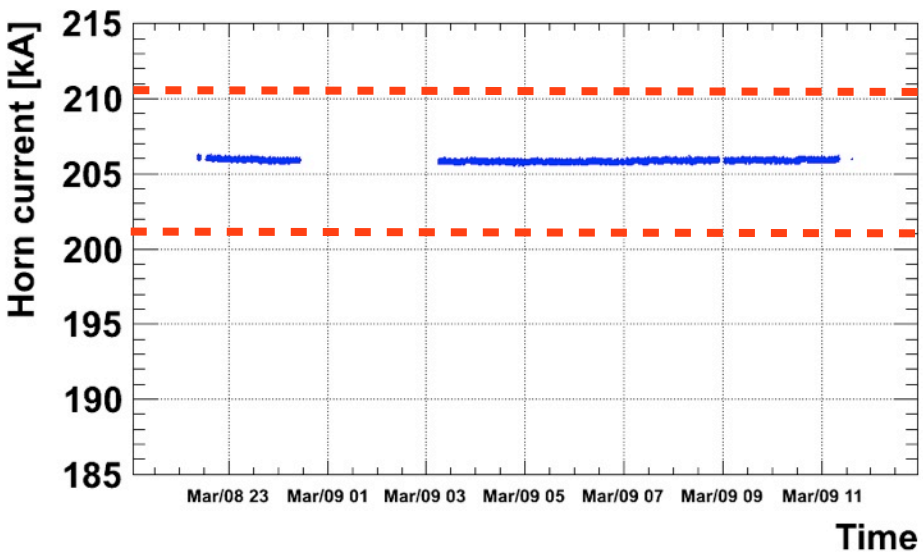
GPS Status



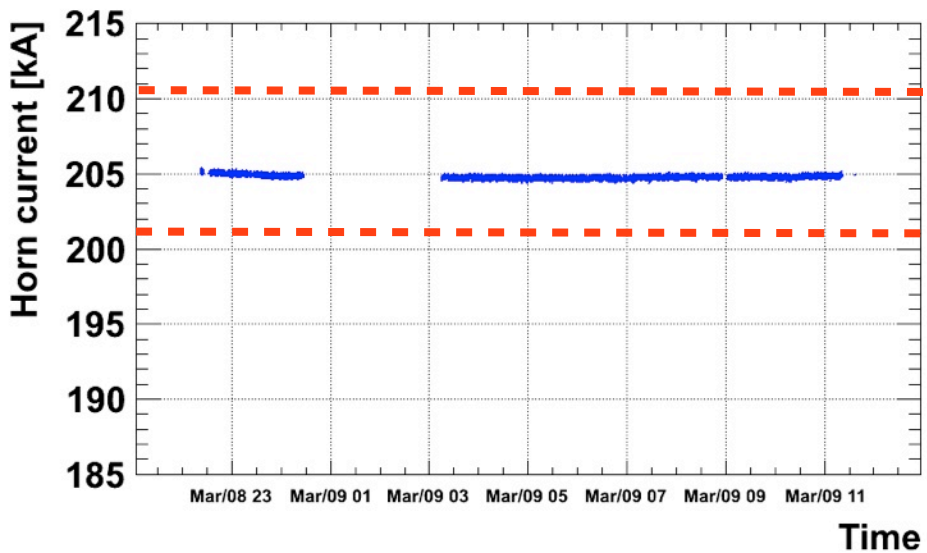
No spills of bad GPS status for 2 GPS recvs

Horn current

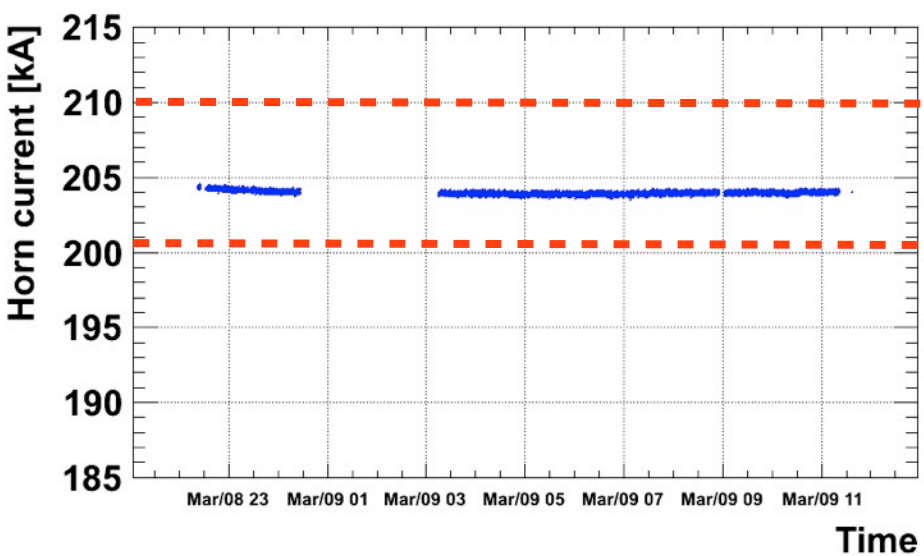
Horn1 current



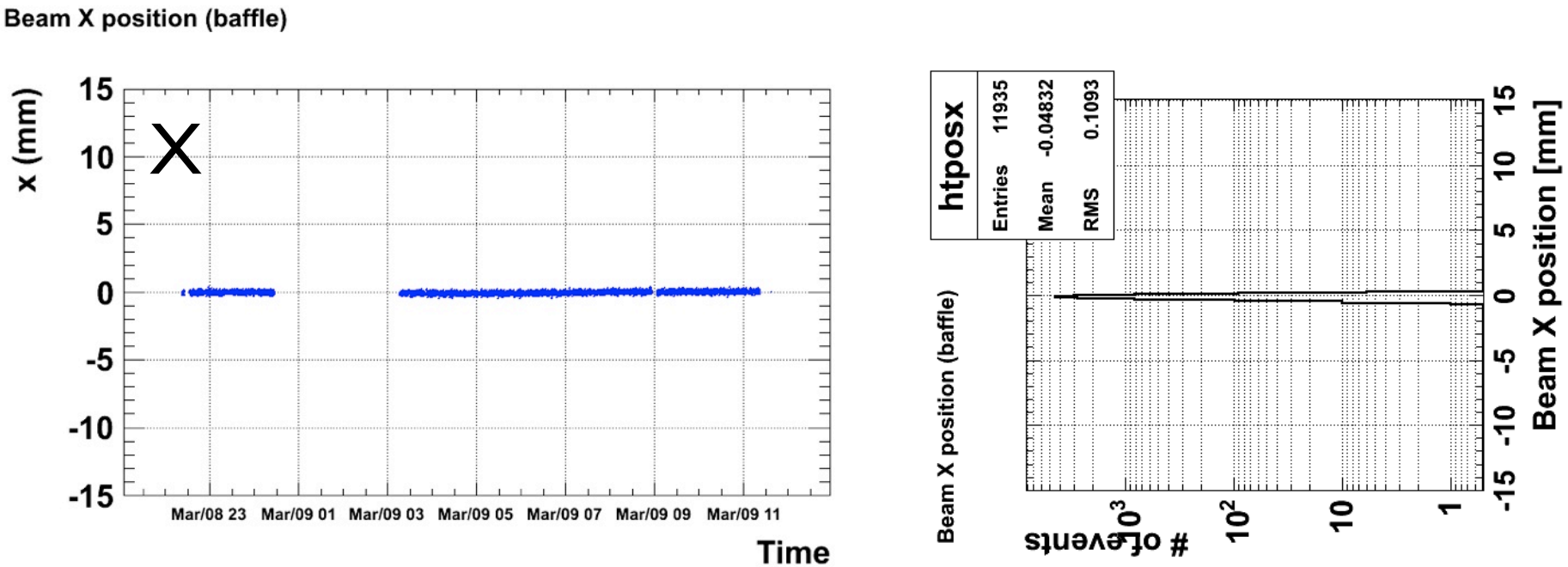
Horn2 current

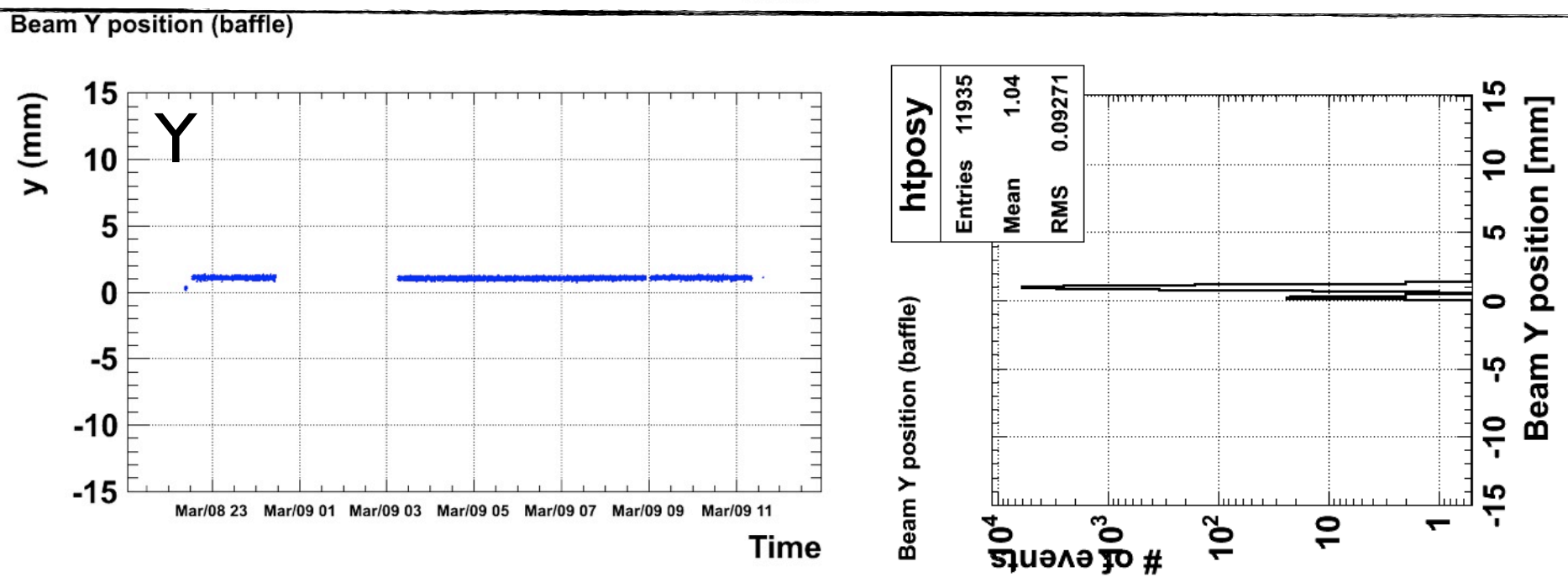


Horn3 current



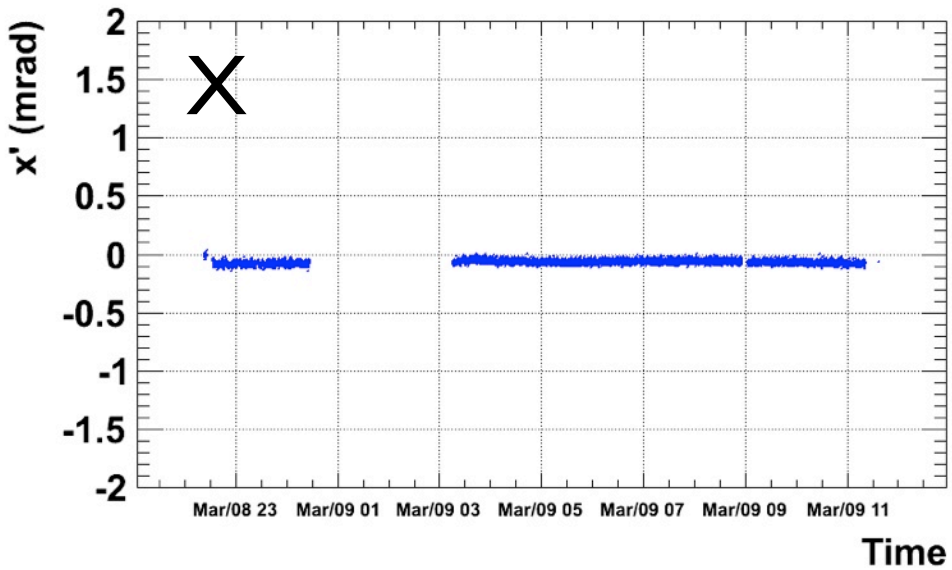
Pbeam center pos

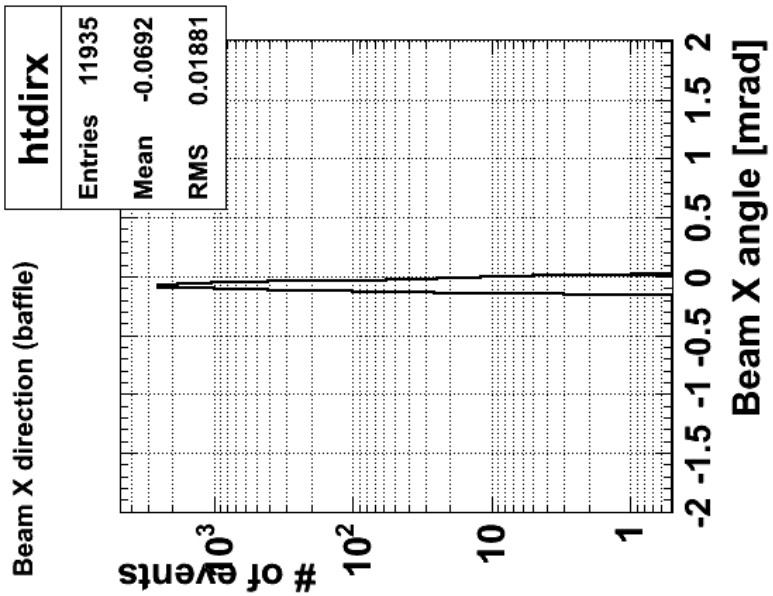




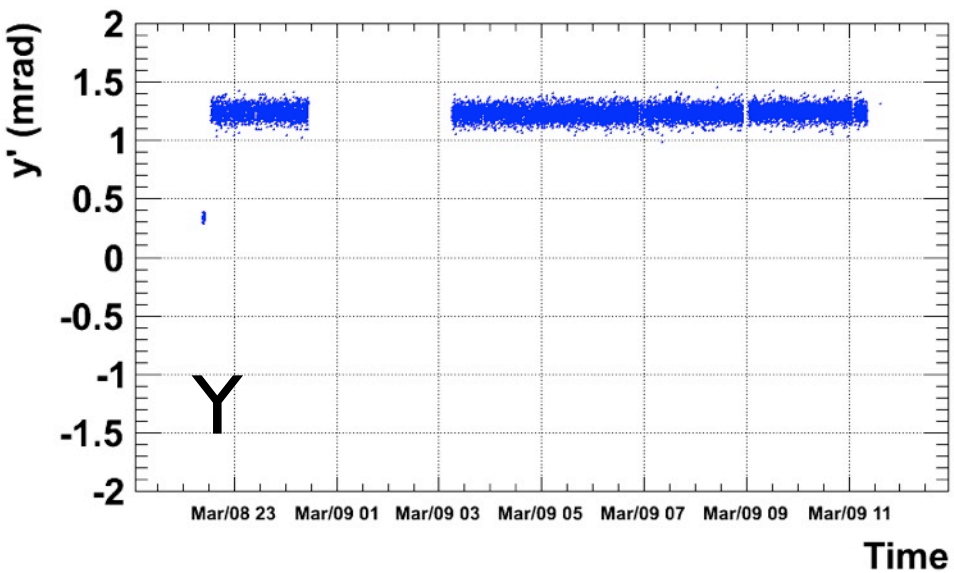
Pbeam center angle

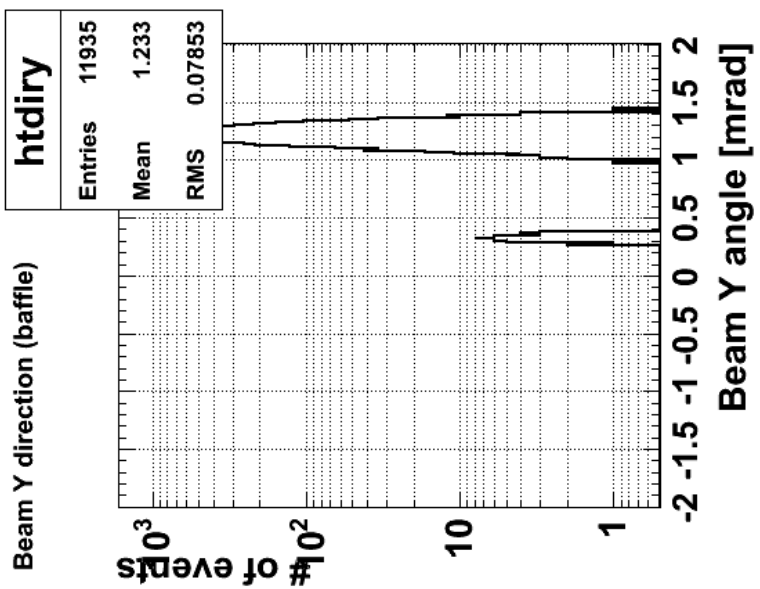
Beam X direction (baffle)



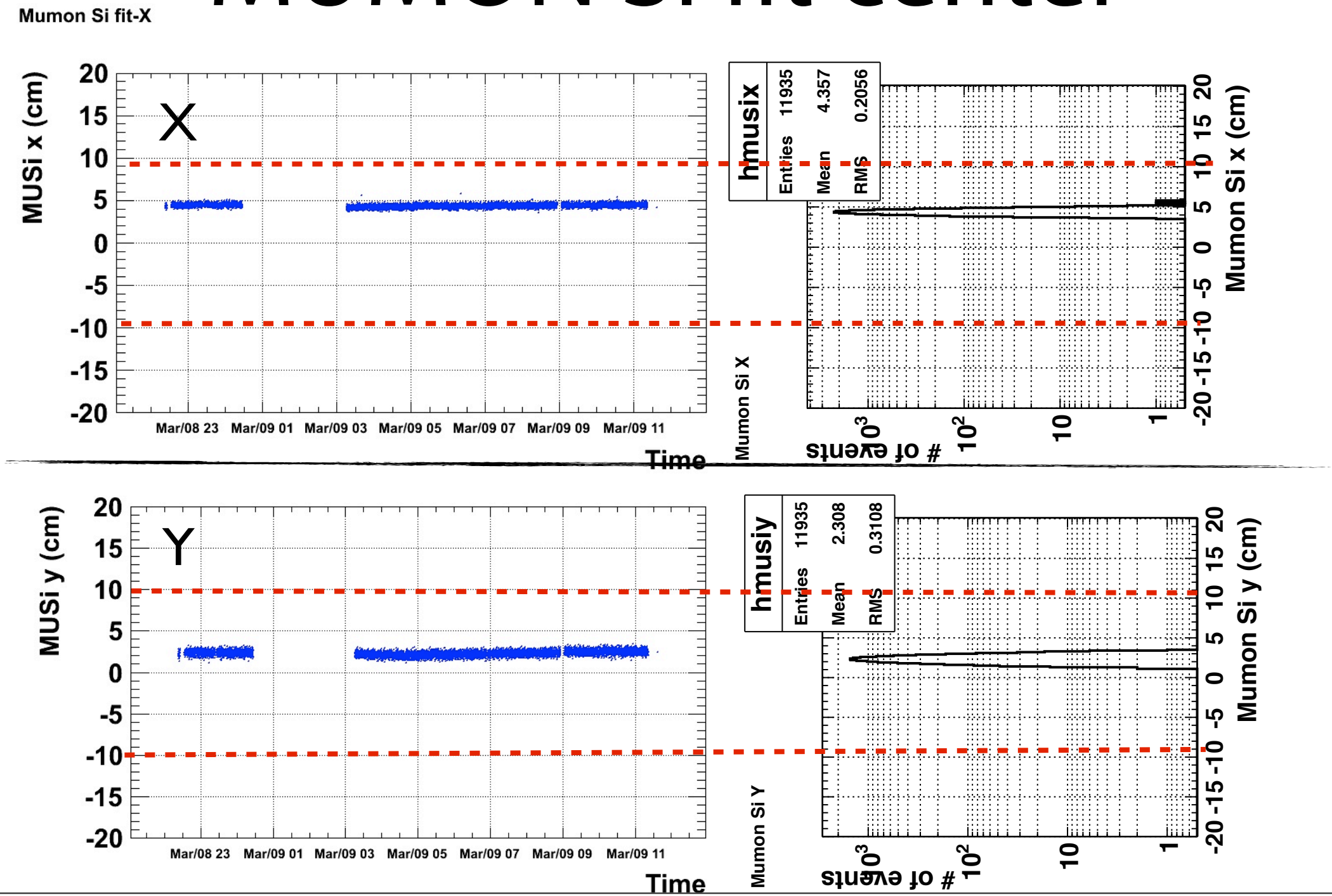


Beam Y direction (baffle)

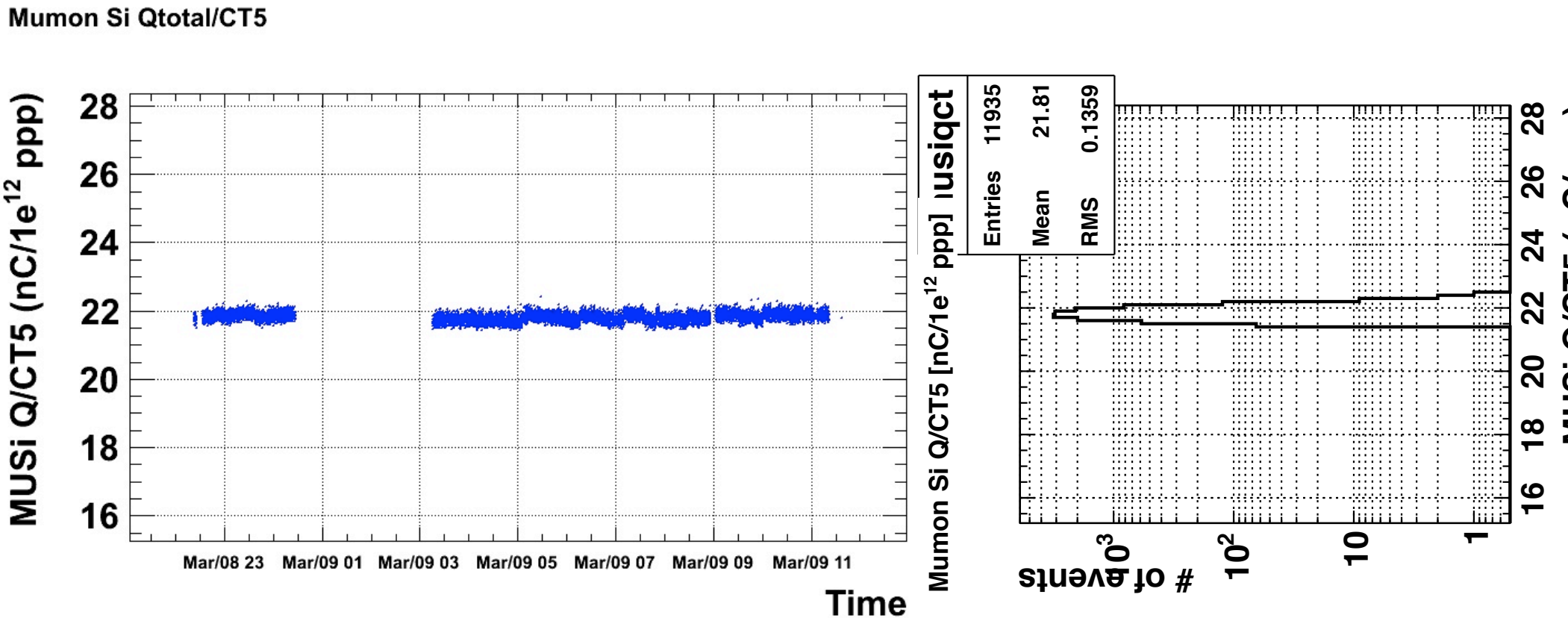




MUMON Si fit center



MUMON Si Q / CT05

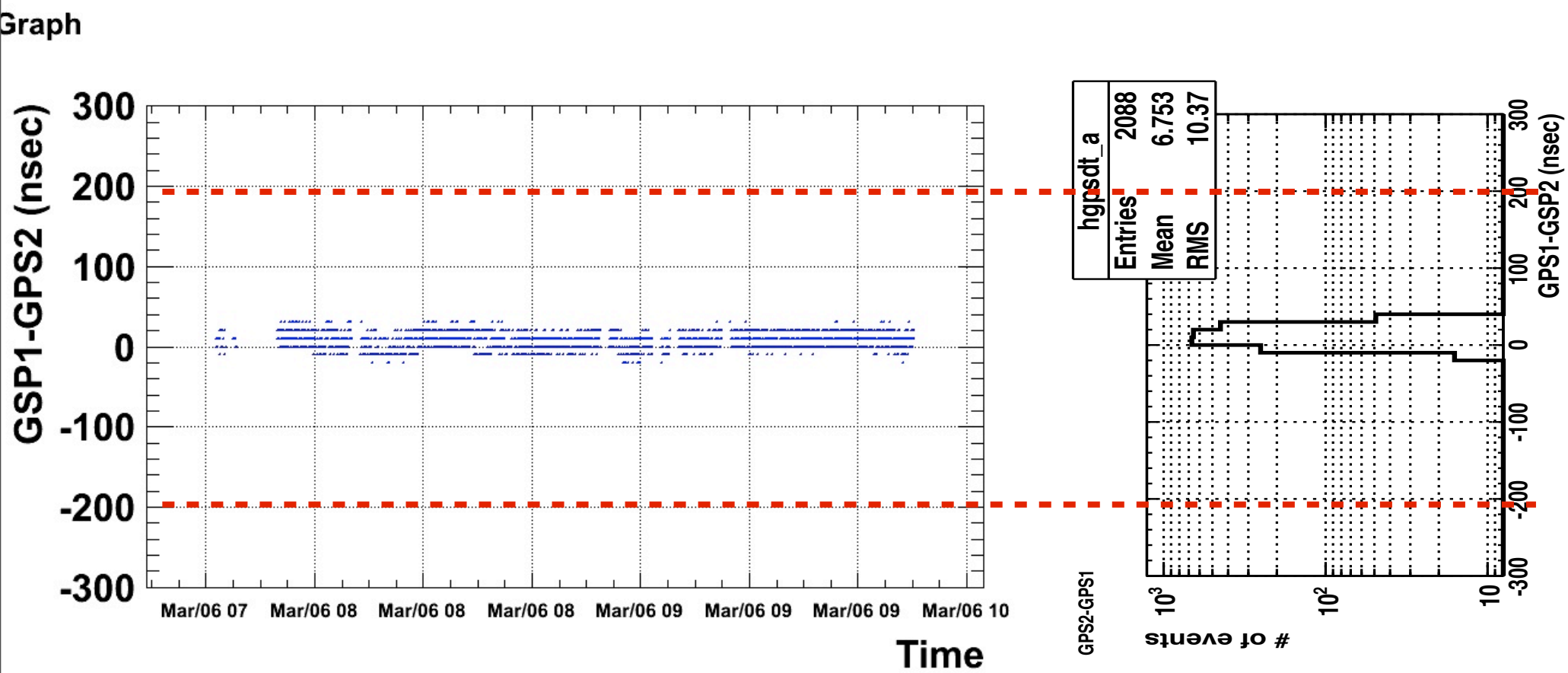


Si Q / CT05 cut = 20.72~22.90

Horn current 250kA

- Run# of used beam data : 410074~410079
  - # of spills in this period : 11973

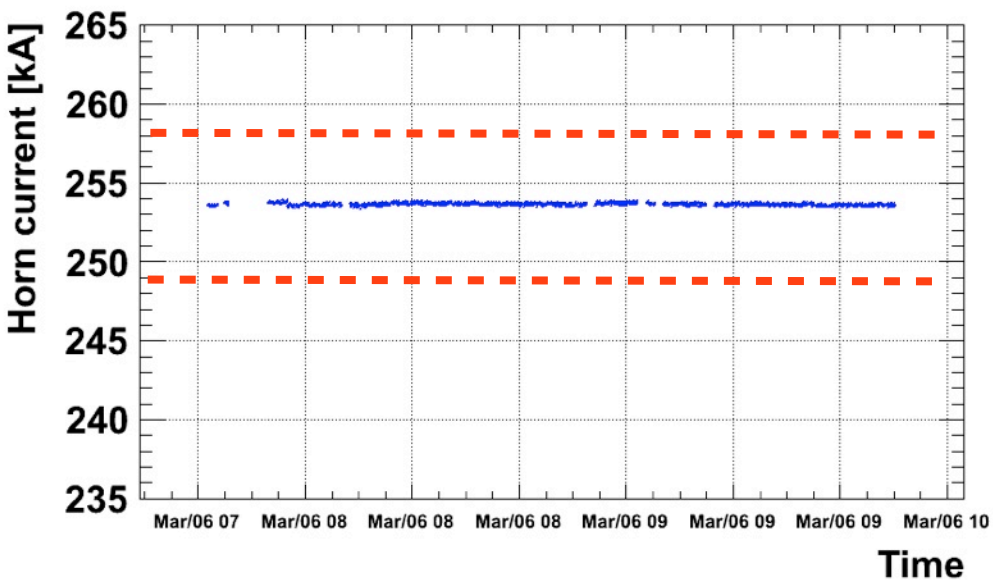
GPS Status



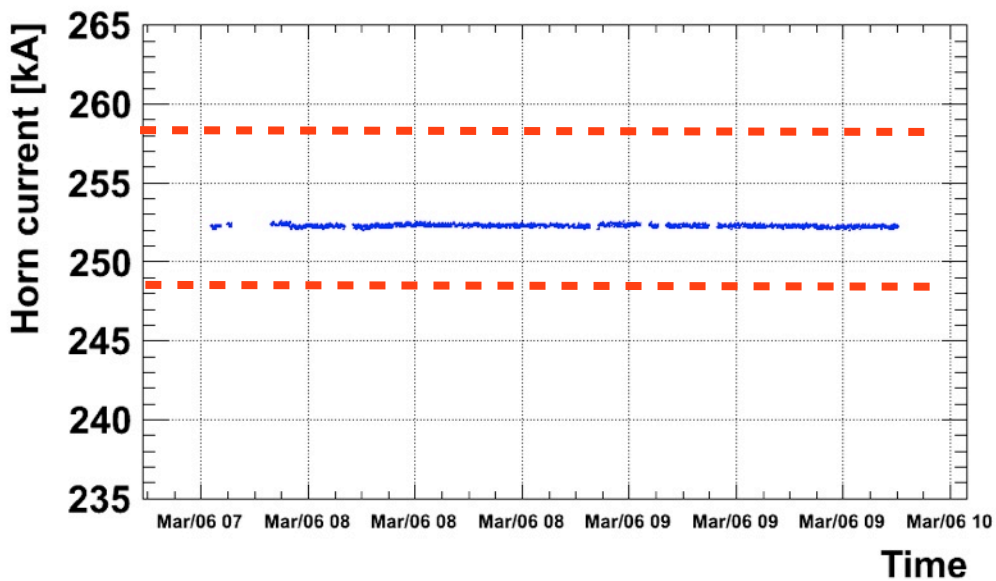
No spills of bad GPS status for 2 GPS recvs

Horn current

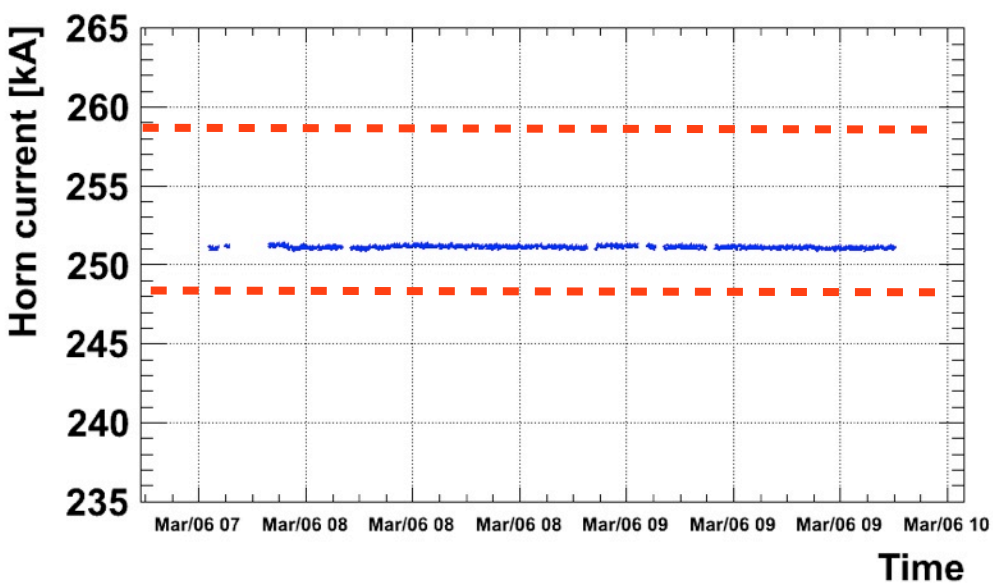
Horn1 current



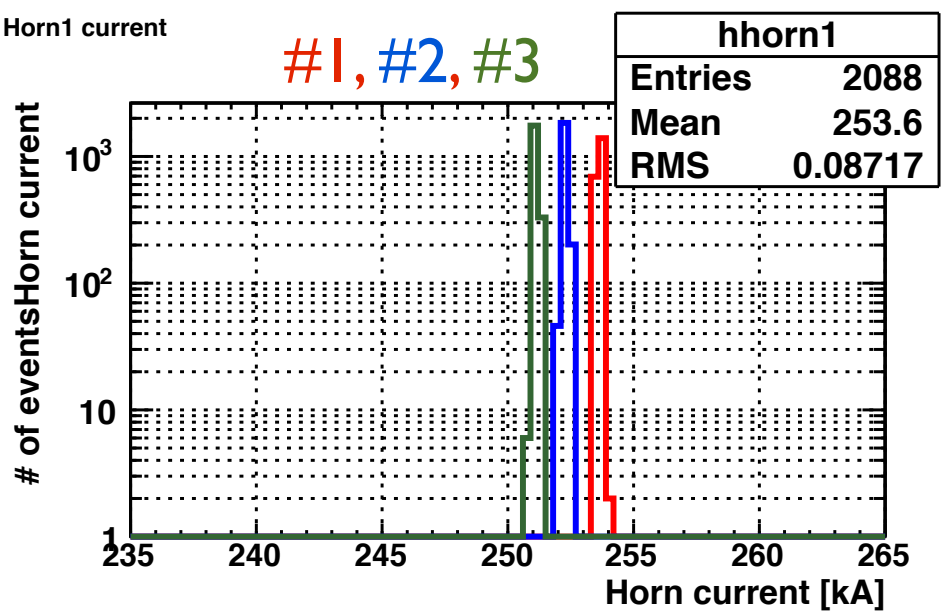
Horn2 current



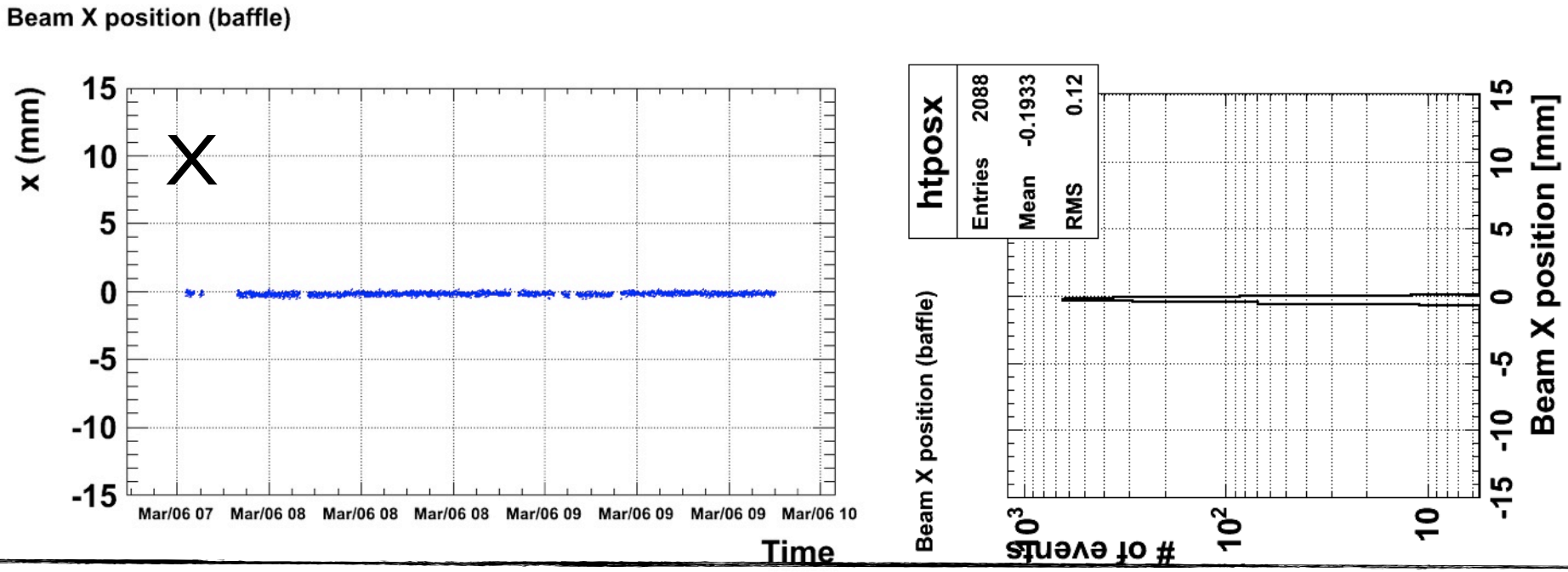
Horn3 current

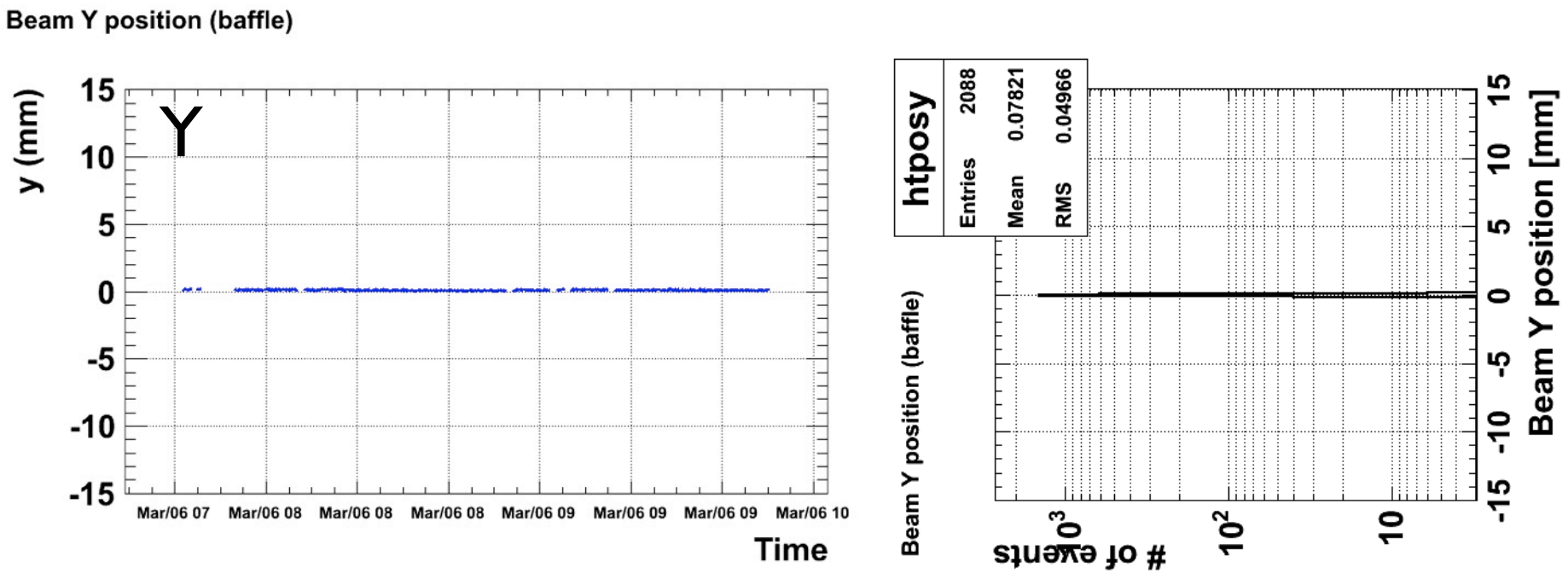


Horn1 current



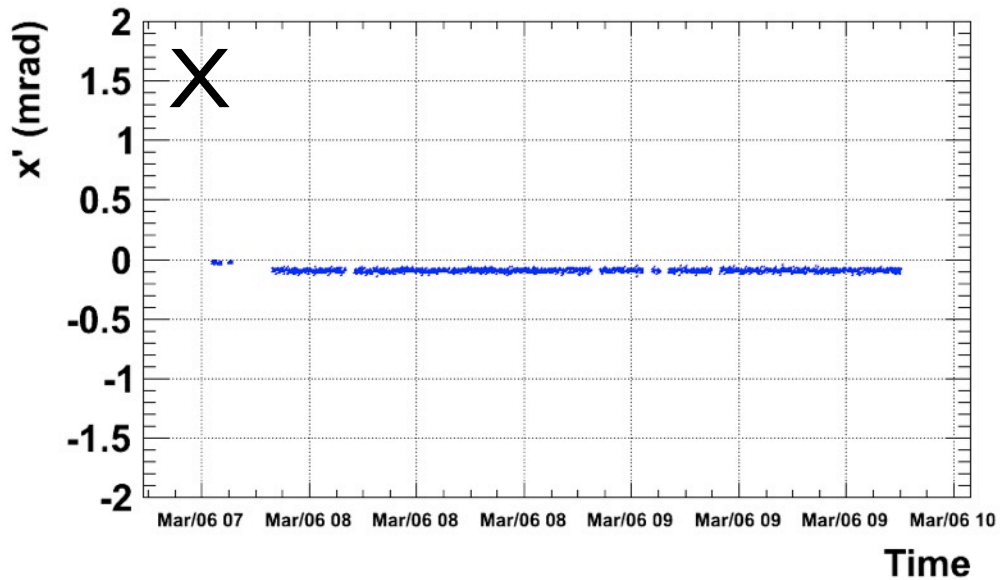
Pbeam center pos

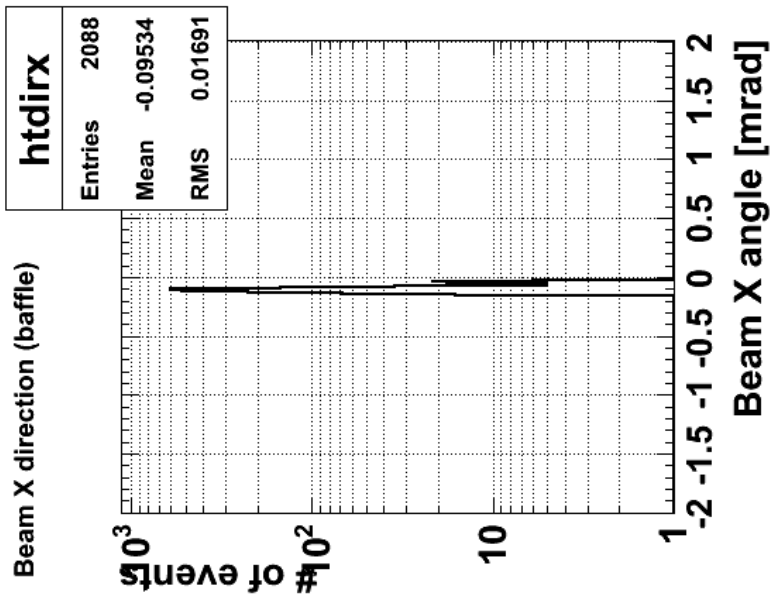




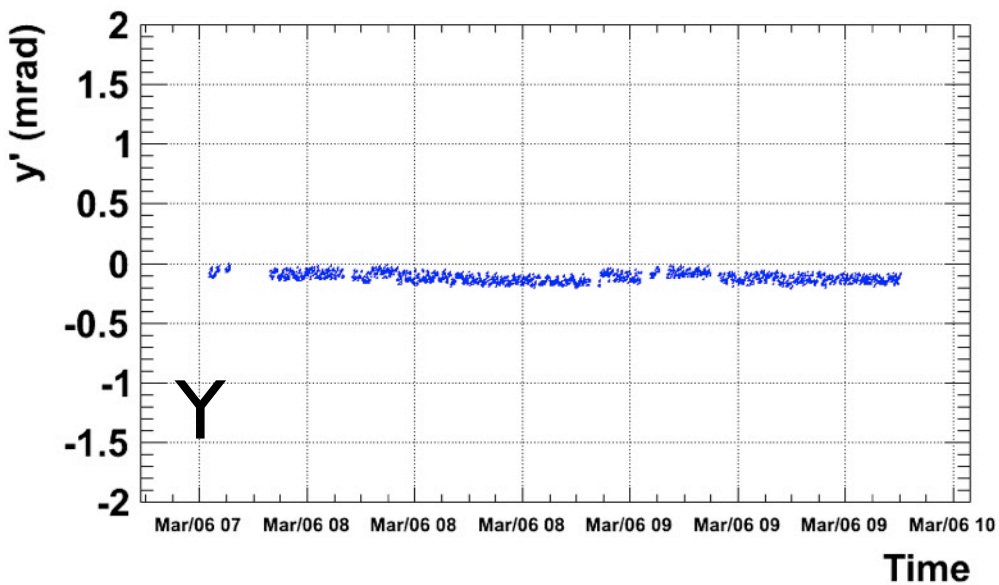
Pbeam center angle

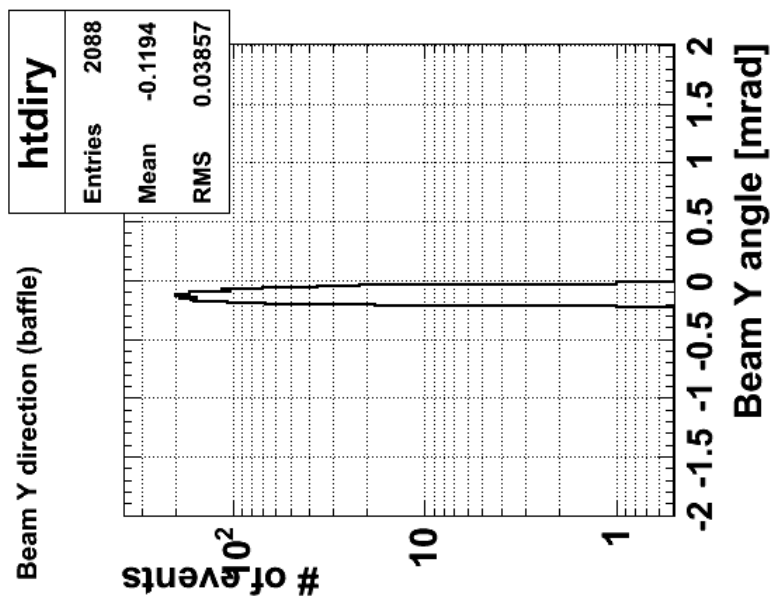
Beam X direction (baffle)



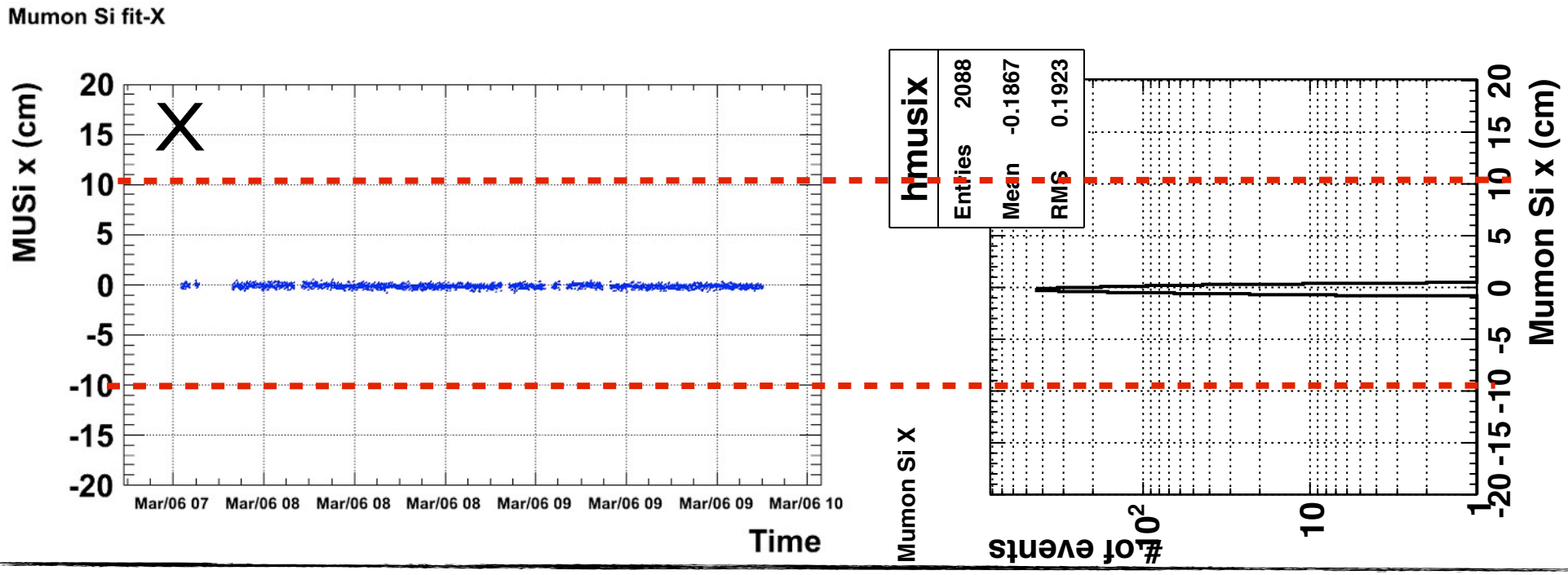


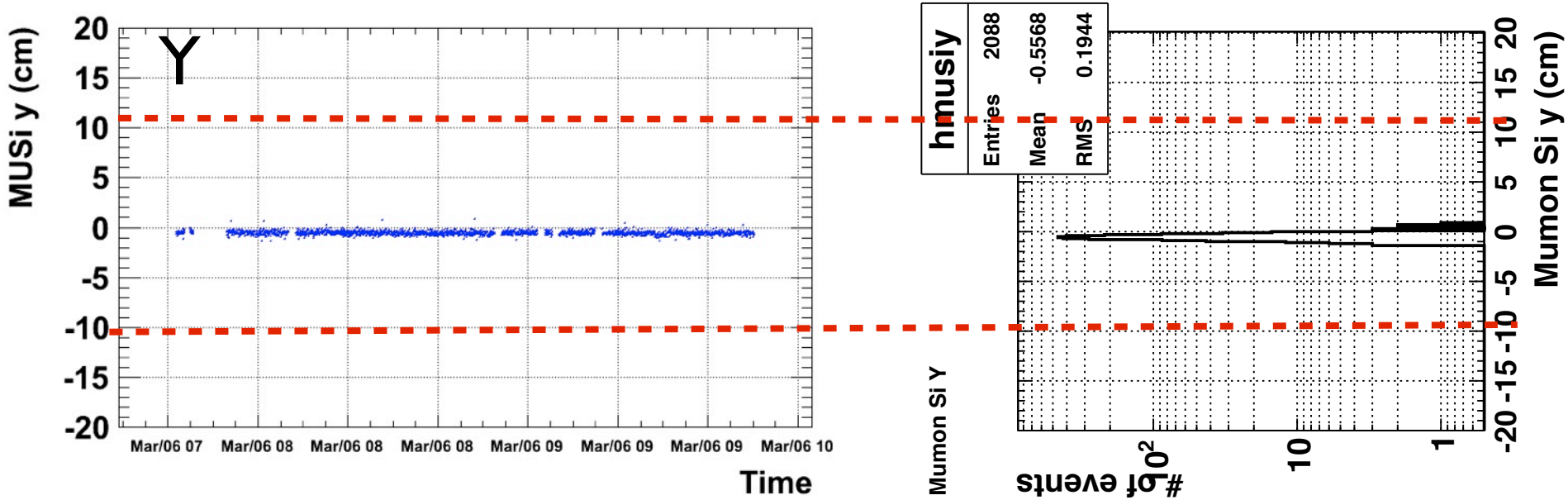
Beam Y direction (baffle)



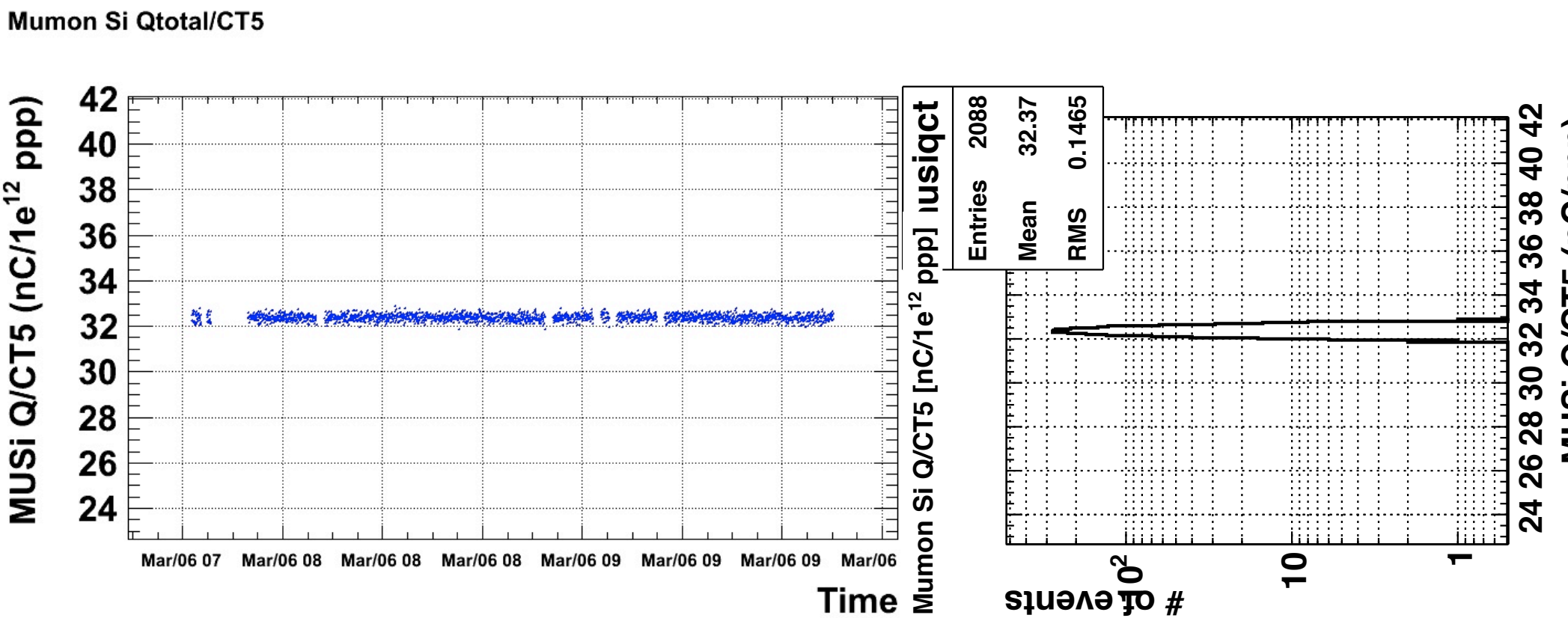


MUMON Si fit center





MUMON Si Q / CT05



Si Q / CT05 cut = 30.8~33.4

Good spill selecton

- Apply good spill selection for these physic run data
  - Horn current & MUMON Si Q /CT5 cut threshold are defined as the followings table.
    - Nominal Horn current = mean of three horns current in each period.
    - Nominal MUMON SiQ / CT5 = mean of this value in each period.

run#	Horn current setting	Horn current cut	MUMON SiQ/ CT5 cut
410052~410053	250kA	252.3 ± 5 kA	32.37 ± 5%
410065~410068	0kA	0kA	8.54 ± 5%
410074~410079	200kA	204.9 ± 5kA	21.8 ± 5%

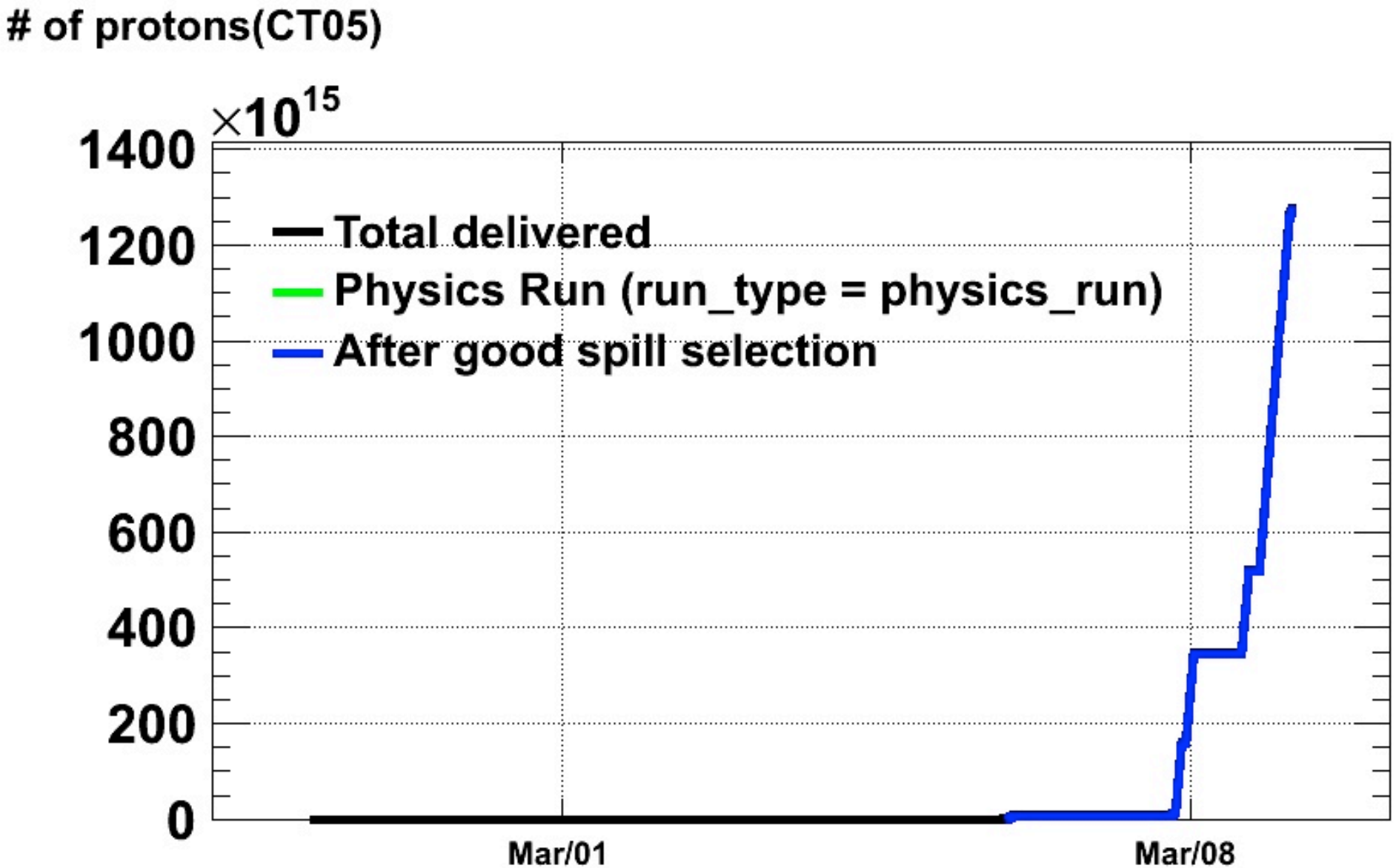
Summary of phsics run

	# of spills	Ratio
Physics spills	18809	1
Beam trigger	18676	0.993
Good GPS	18676	0.993
ppp(CT5)>1e11	18598	0.989
Normal beam	18598	0.989
Horn cut	18598	0.989
MUMON cut	18598	0.989

# of delivered protons(CT5) after Good spill selection

Total POT : 1.28e18

POT history (in MR Run41)



Definition of Good spill flag

- Rule:
  - In order to distinguish the Horn-off spill from the horn ON spill, the value of the good flag will be re-defined.
    - flag =0 : Not suitable data for physics analysis.
    - flag =1 : Good spill for Horn 250kA operation.
    - flag =100 : Good spill for Horn OFF.
    - flag = 2, 3 ... 99: Reserved for the other horn operation mode.
    - flag =-1,-2 ... -99: Reserved for the other horn operation mode with opposite polarity.

horn current	0 kA	200 kA	250 kA
good spill flag	100	2	1

Summary

- Beam summary process & check is done day by day (as much as possible).
- No spills failed by good spill selection during physic run operation shown in this slide (~run#410079).
- For proton beam center position/angle fitted w/o SSEM out, need another process to do fit precisely.
    - Proton beam info is not used for good spill selection. So, this priority is low for good spill selection ?