Beam summary data in T2K RUN3b and RUN3c

A.Murakami for beam group

Overview

- Show the results of the good spill selection for the beam data in RUN3b and RUN3c
  - RUN3b : Beam line Run# **410074(3/8) ~ 410208(3/22)**
    - Horn current setting : **200kA**
  - RUN3c : Beam line Run# **420022(4/8) ~ 420147(4/20)**
    - Horn current setting : **250kA**

Reminder : Spill selection

Quick spill selection

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...)

Good spill selection

6. Horn current cut
   - Nominal current ± 5 kA for all three horns
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%

Definition of Good spill flag

- 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

T2K RUN1&2&3c : flag=1, T2K RUN3b : flag=2

Threshold of horn & mumon cut

- Horn current & MUMON Si Q /CT5 cut threshold are defined as the followings table.
  - Horn cut : (Mean of three horns current in physics run) ± 5 kA
  - MUMON SiQ / CT5 cut : (Mean of this ratio in physics run) ± 5%

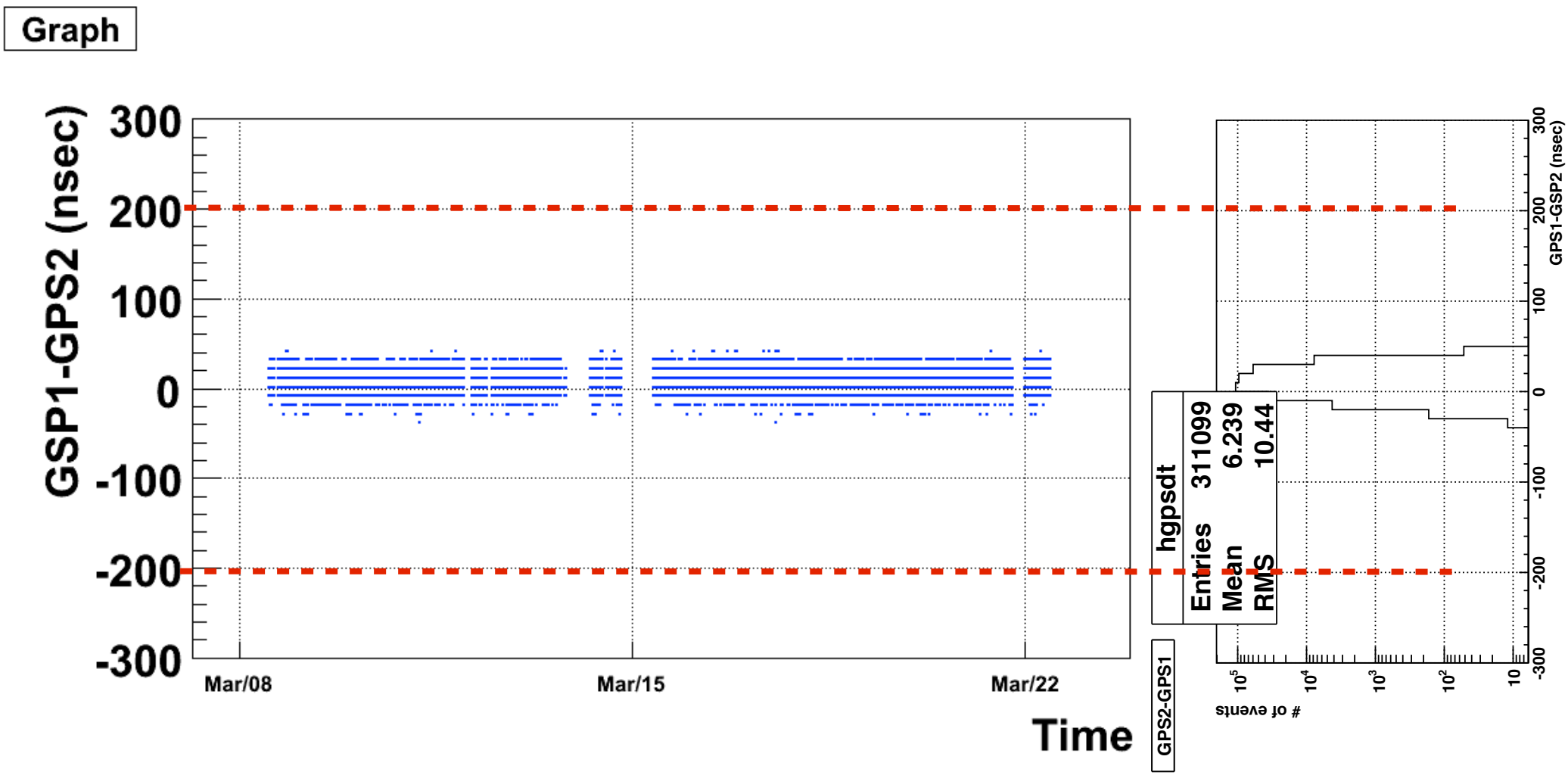
Period	Horn current setting	Horn current cut	MUMON SiQ/ CT5 cut
RUN3b (410074~410208)	200kA	204.7 ± 5kA	21.65 ± 5%
RUN3c (420022~420147)	250kA	249.8 ± 5kA	32.24 ± 5%

Good spill selection for RUN3b

Normal condition cut (RUN3b)

- Remove 4 spills in run# **410192** by normal condition cut
  - spill#=1919127 : Beam stop due to MPS of MR Beam loss monitor
  - spill#=1919128 : 1 shot after recover of above MPS.
  - spill#=1919129 : Check beam condition (2bunch beam) after setting magnets
  - spill#=1919130 : Check beam condition (8bunch)

GPS Status



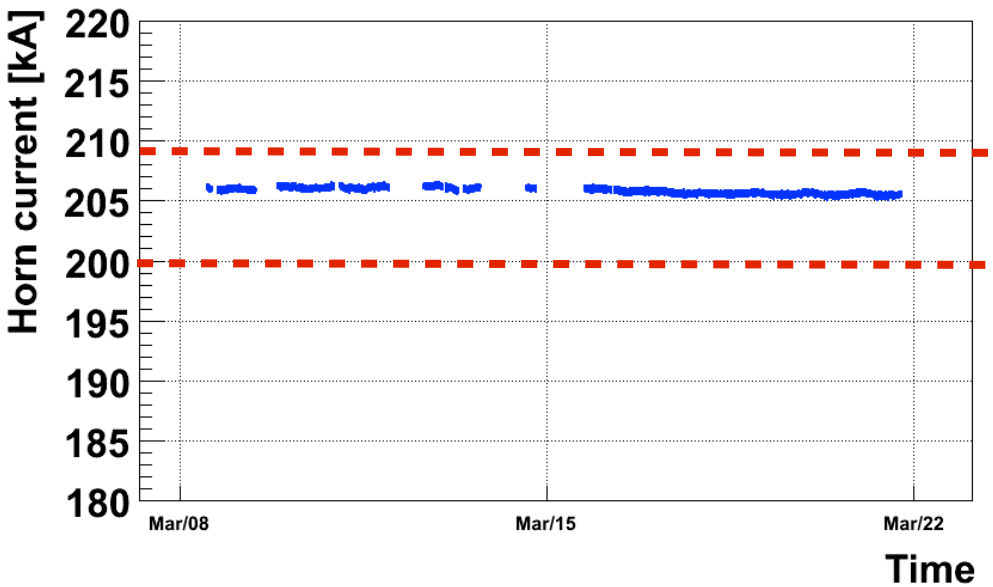
GPS1,2 status are good during this period

No Bad spill

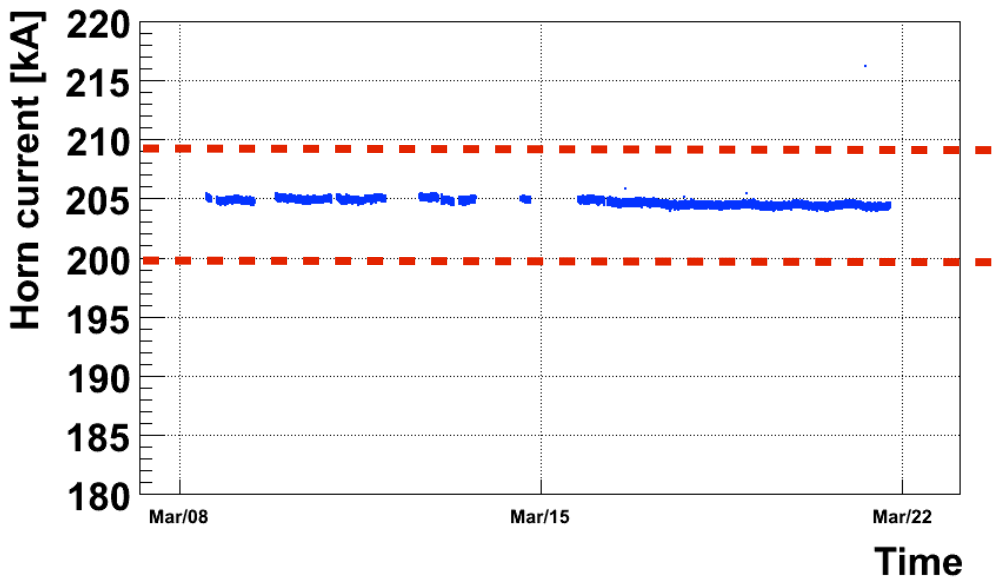
Horn current

204.7 ± 5kA

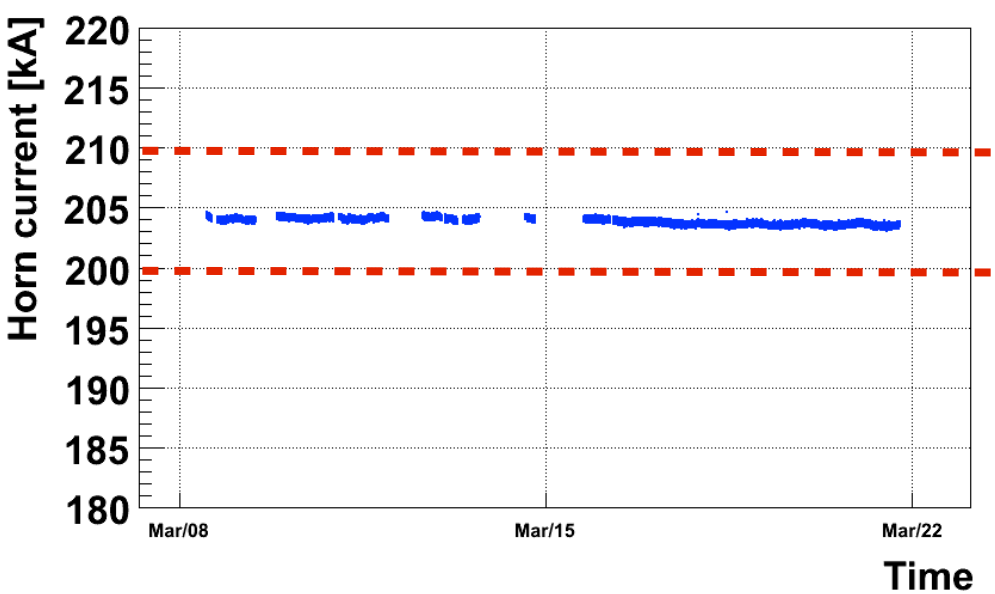
Horn1 current

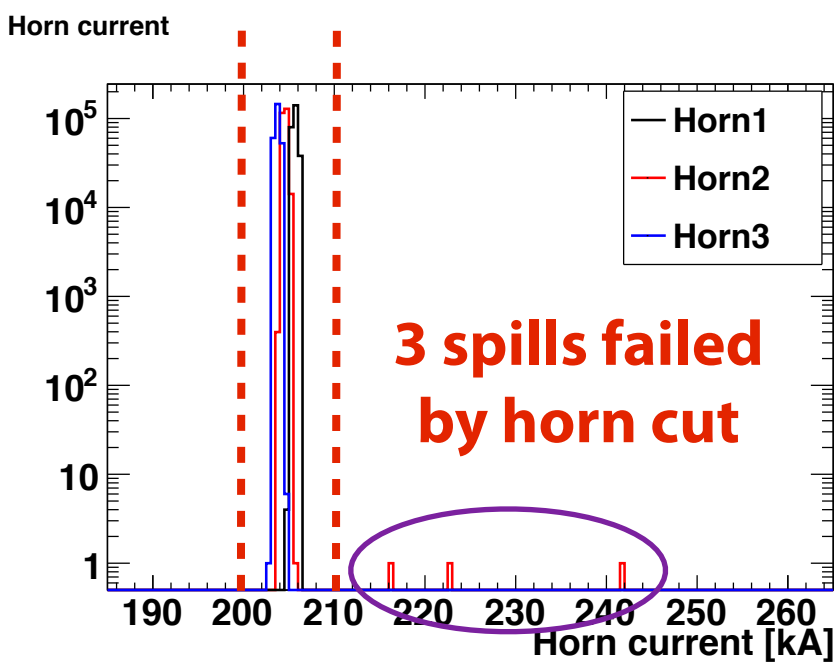


Horn2 current

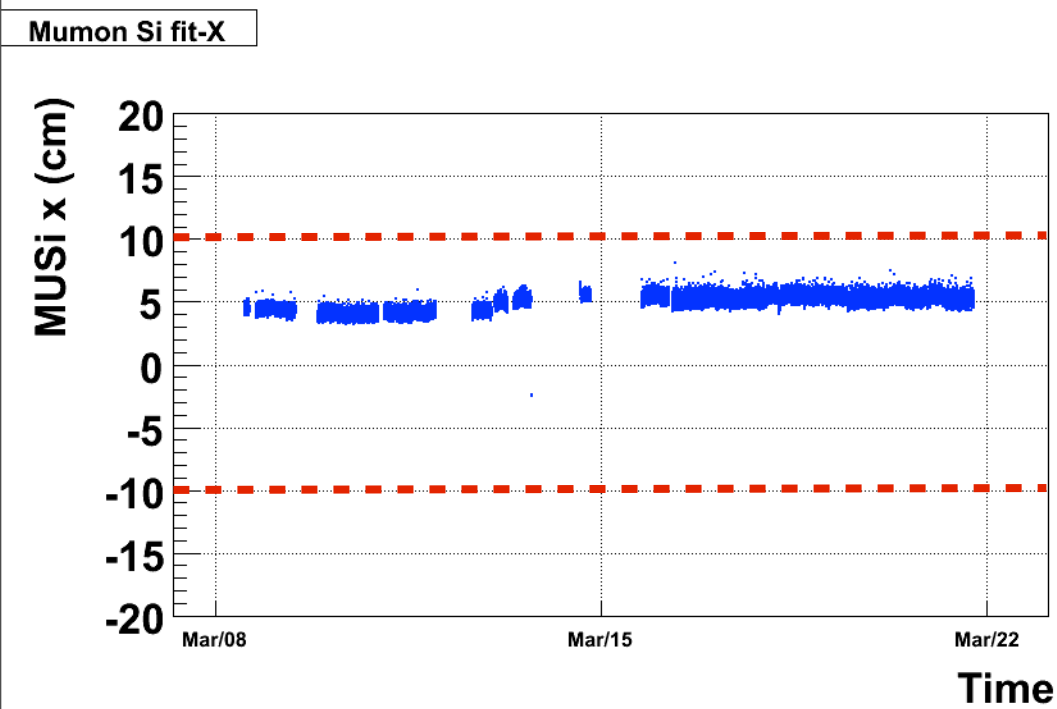


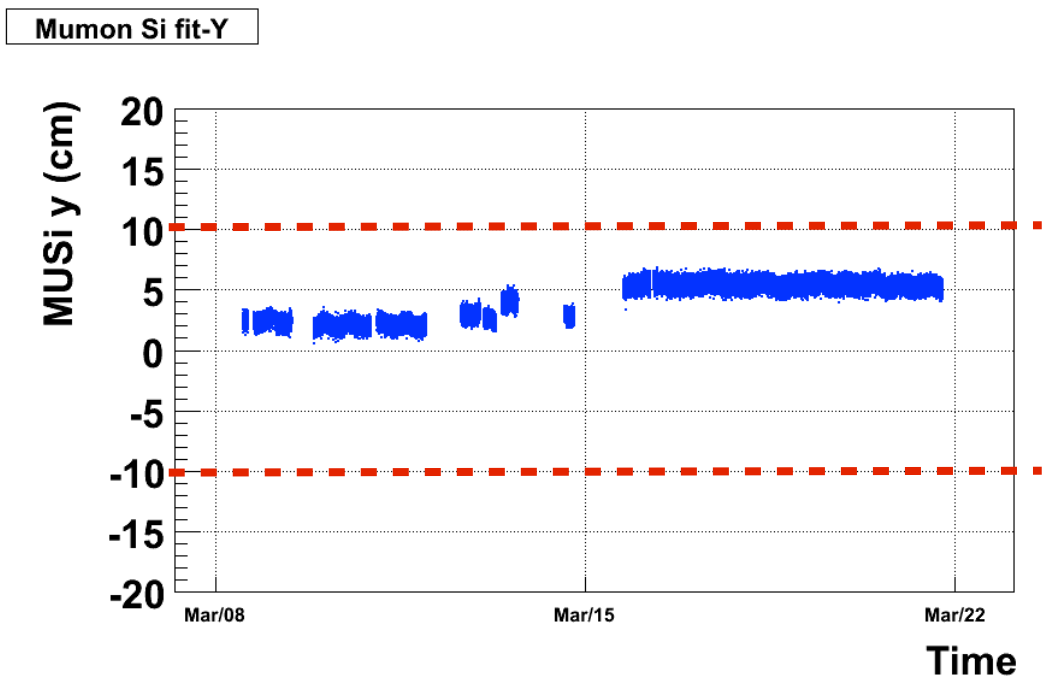
Horn3 current





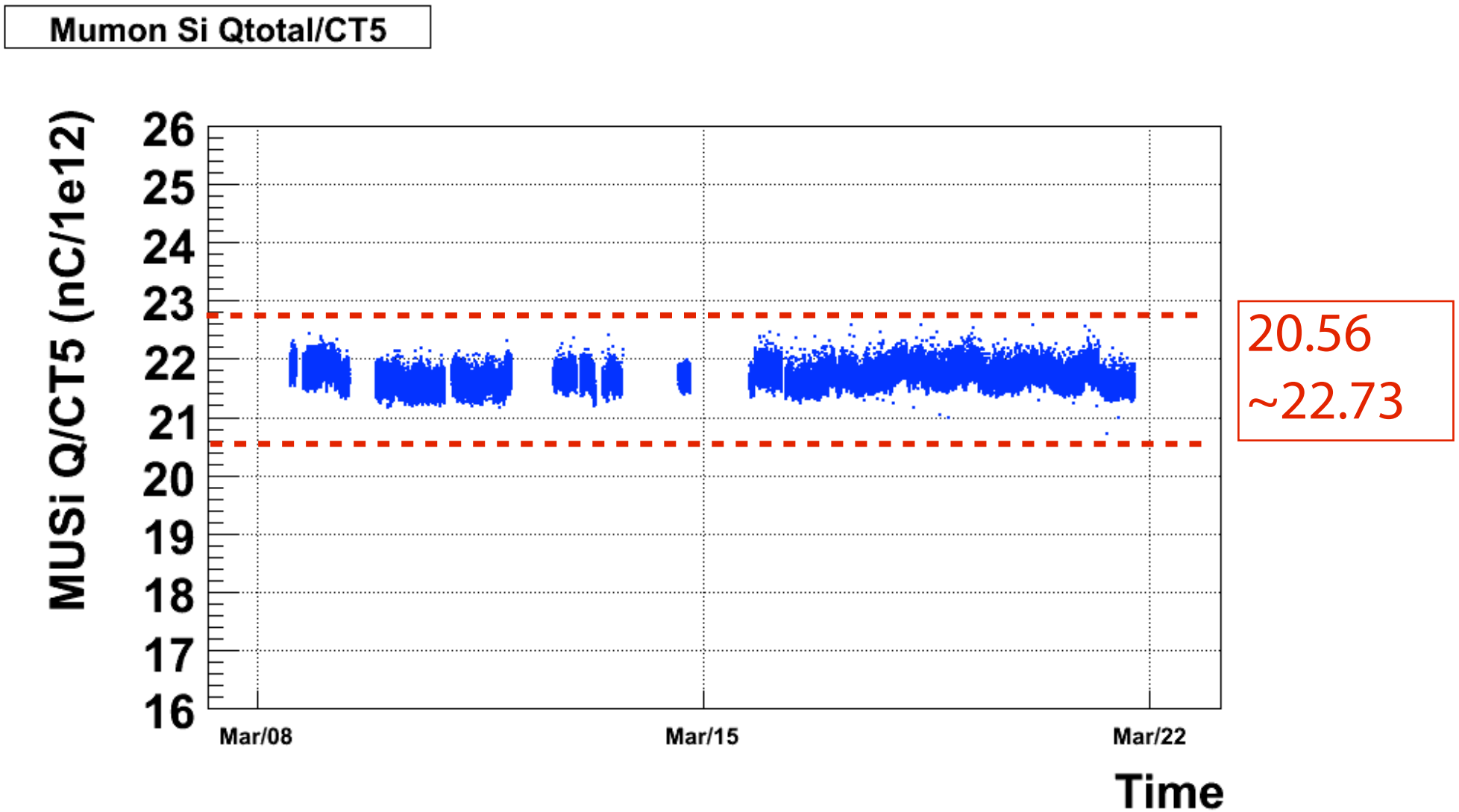
MUMON Si fit center





No Bad spill (not including horn bad spills)

MUMON Si Q / CT05



No Bad spill (not including horn bad spills)

Good spill for physics runs (RUN3b)

Run# 410074(3/8)~410208(3/22)

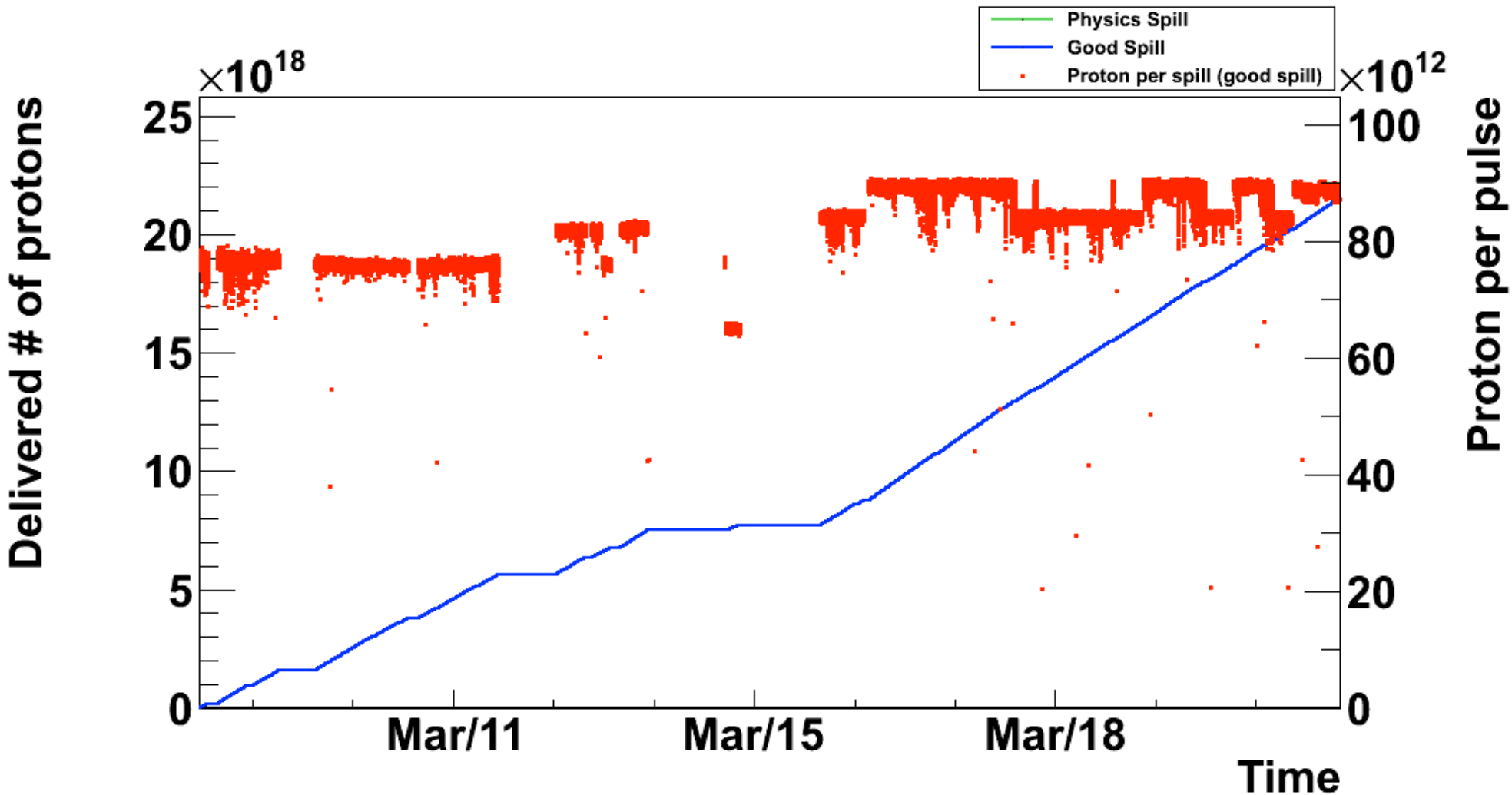
	# of spills	Ratio
Physics spills	259759	1
Beam trigger	258975	0.997
Good GPS	258975	0.997
ppp(CT5)>1e11	258802	0.996
Normal beam	258797	0.996
Horn cut	258794	0.996
MUMON cut	258794	0.996

# of delivered protons(CT5) after Good spill selection

Integrated POT : 2.15e+19

Integrated POT (RUN3b)

Run# 410974(3/14)~410208(3/22)

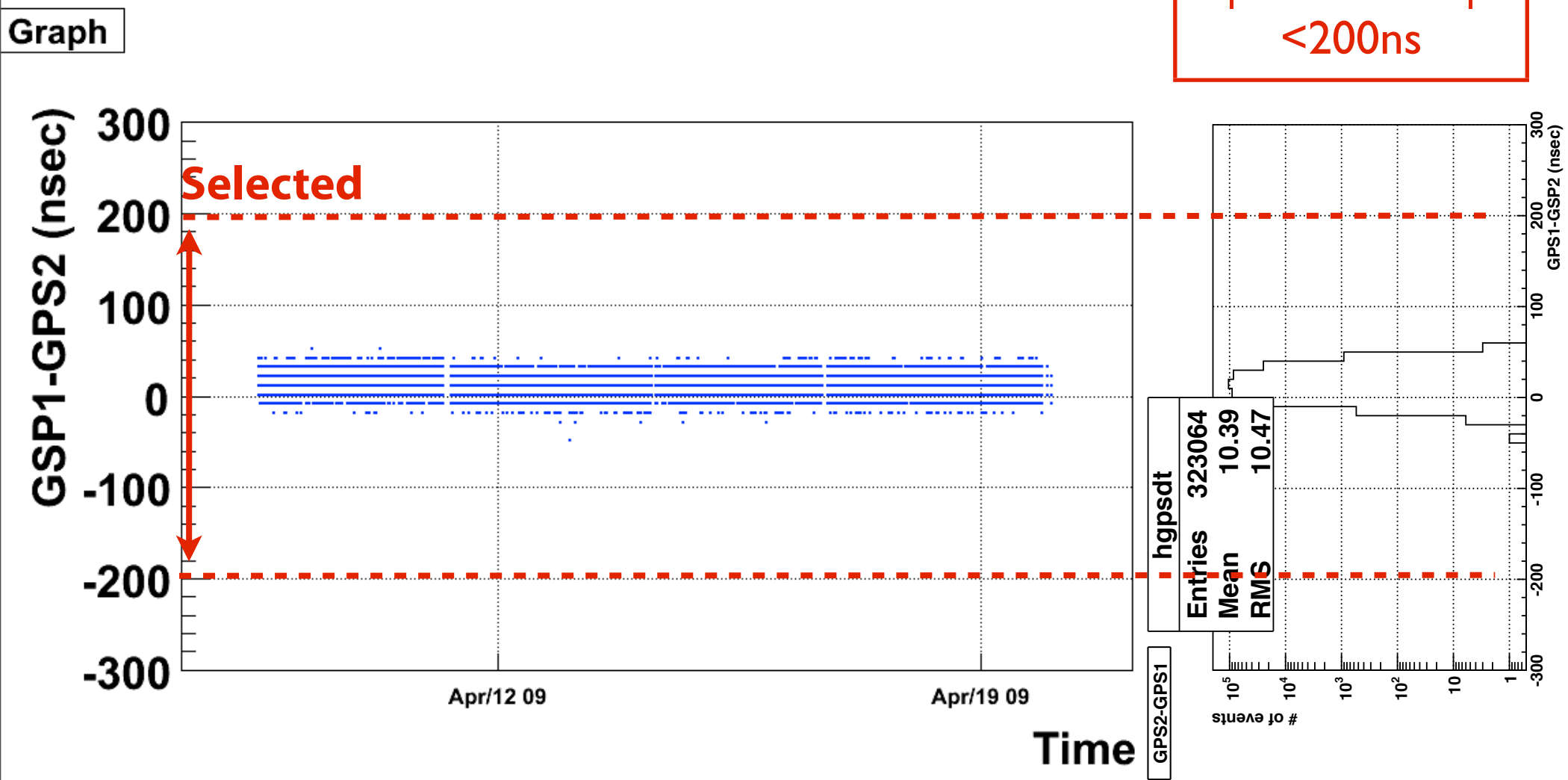


Integrated POT : 2.15e+19

Good spill selection for RUN3c

GPS Status

|GPS1-GPS2|
<200ns



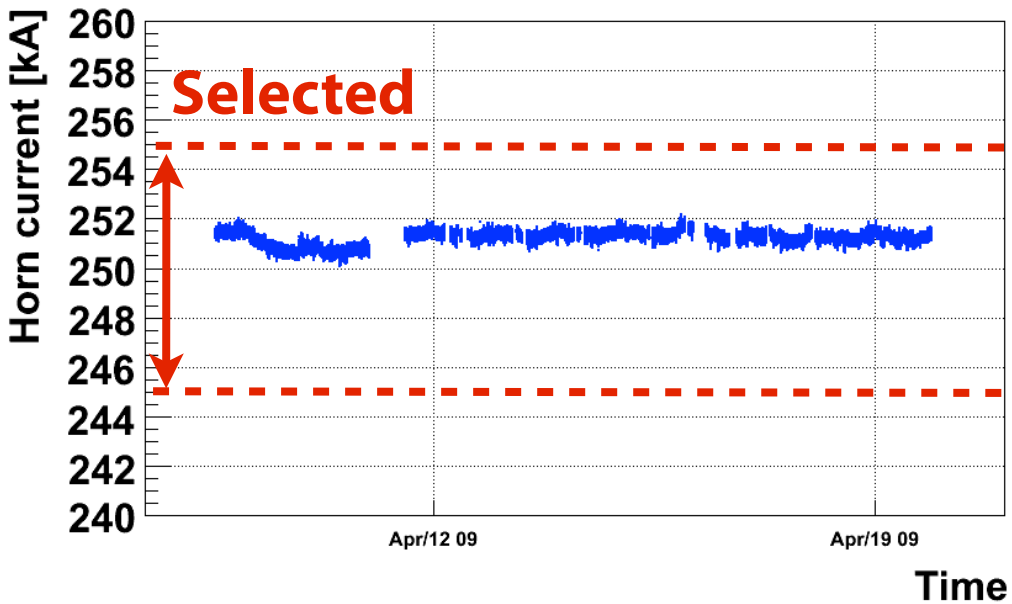
GPS1,2 status are good during this period

No Bad spill

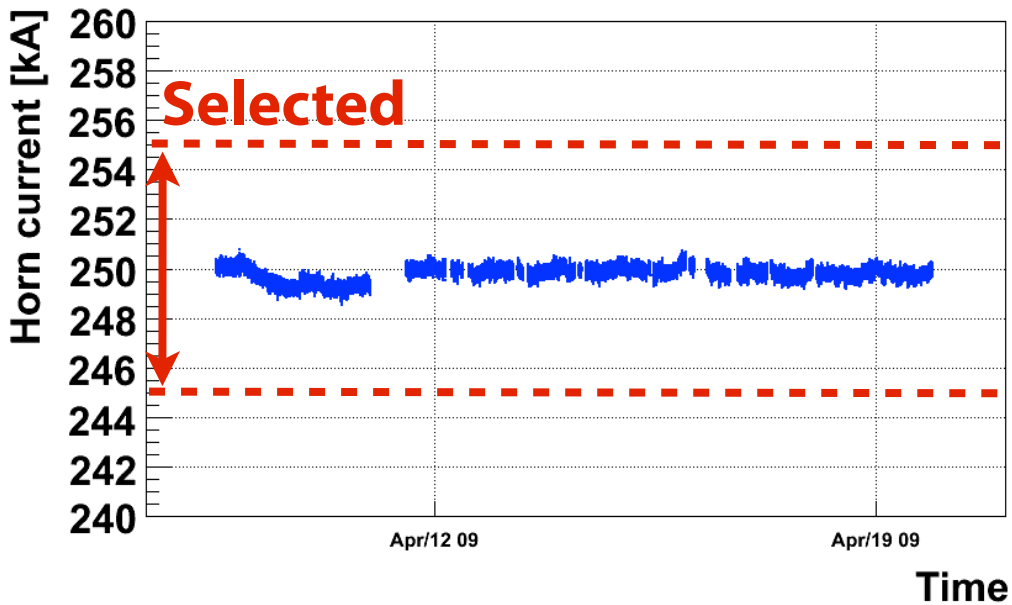
Horn current

249.8 ± 5kA

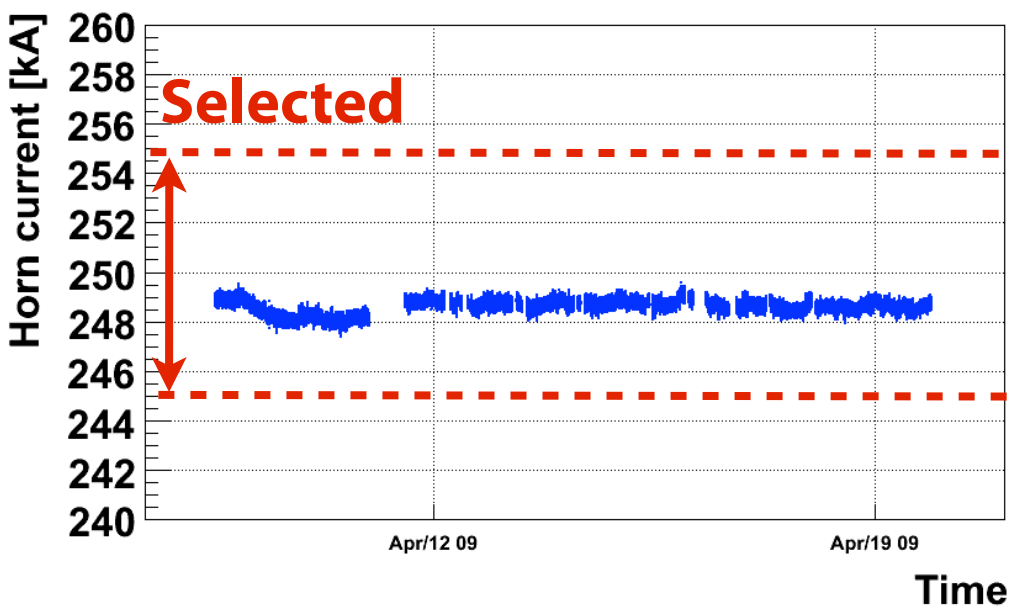
Horn1 current



Horn2 current

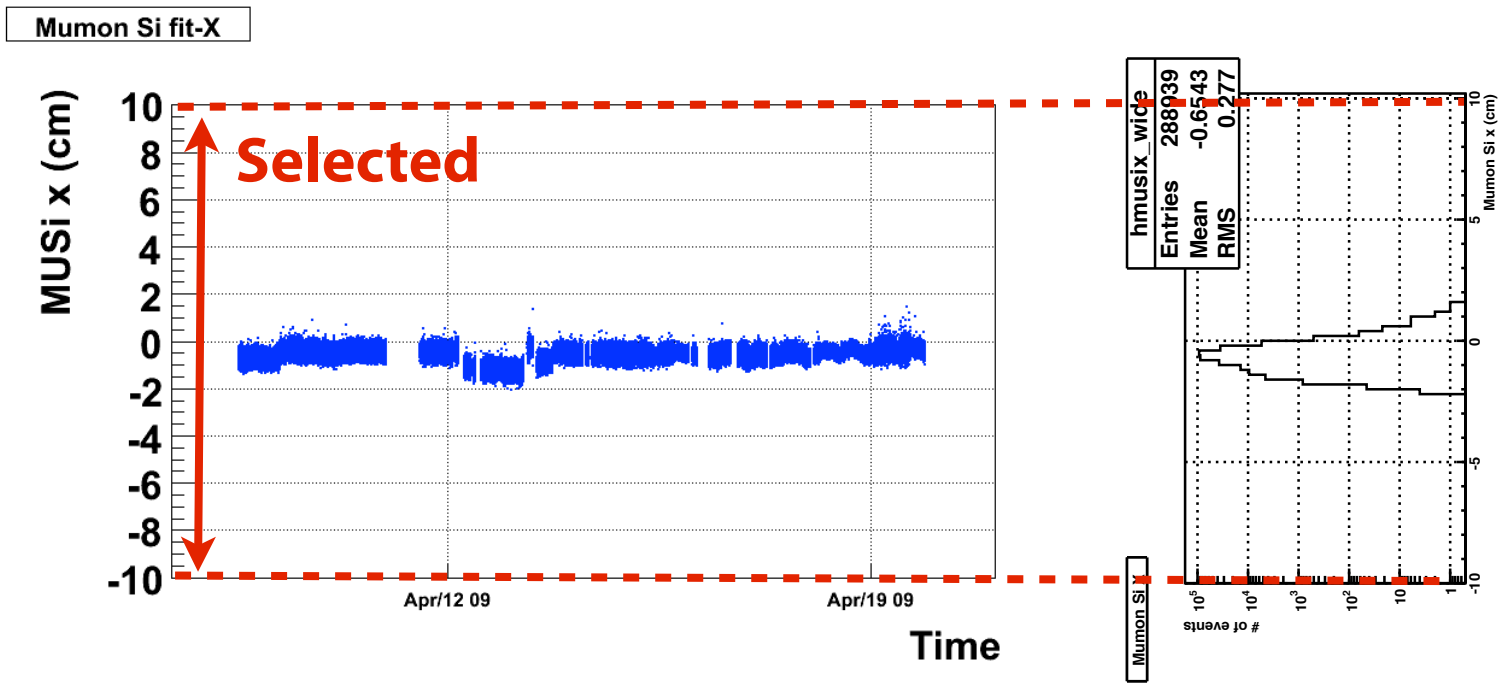


Horn3 current

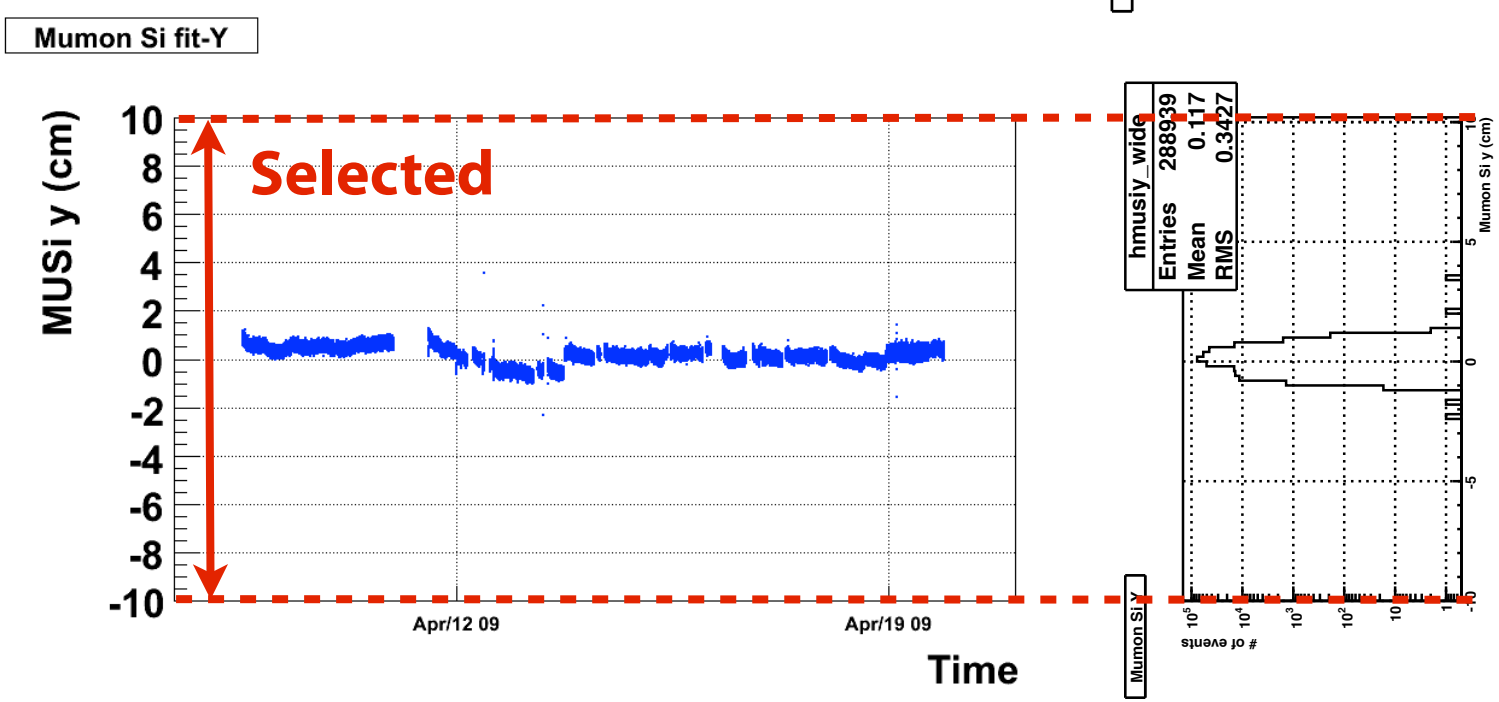


No bad spill

MUMON Si fit center



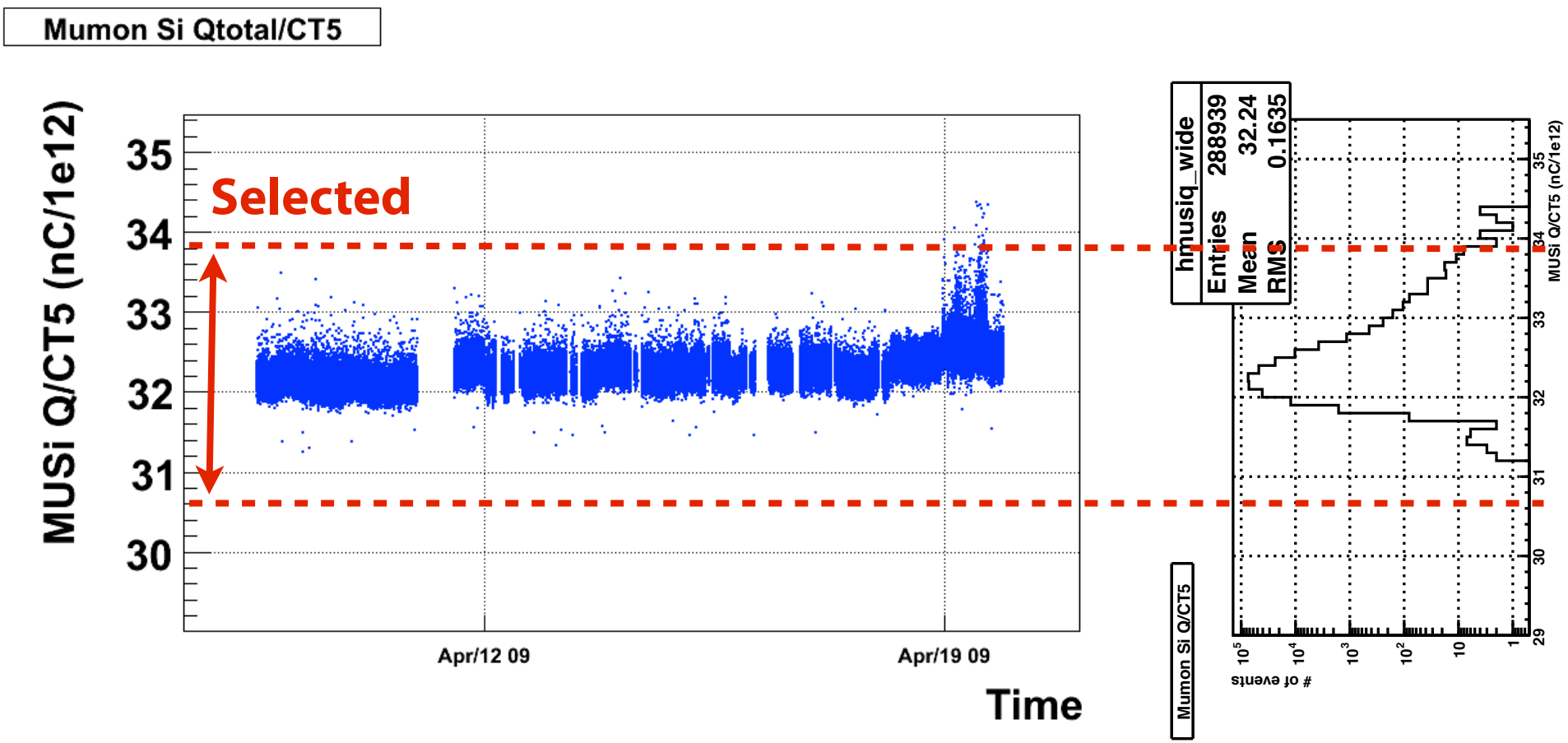
fit center
< 10cm



No Bad spill

MUMON Si Q / CT05

32.24 ± 5%



15 Bad spills

Summary of Good spill selection (RUN3c)

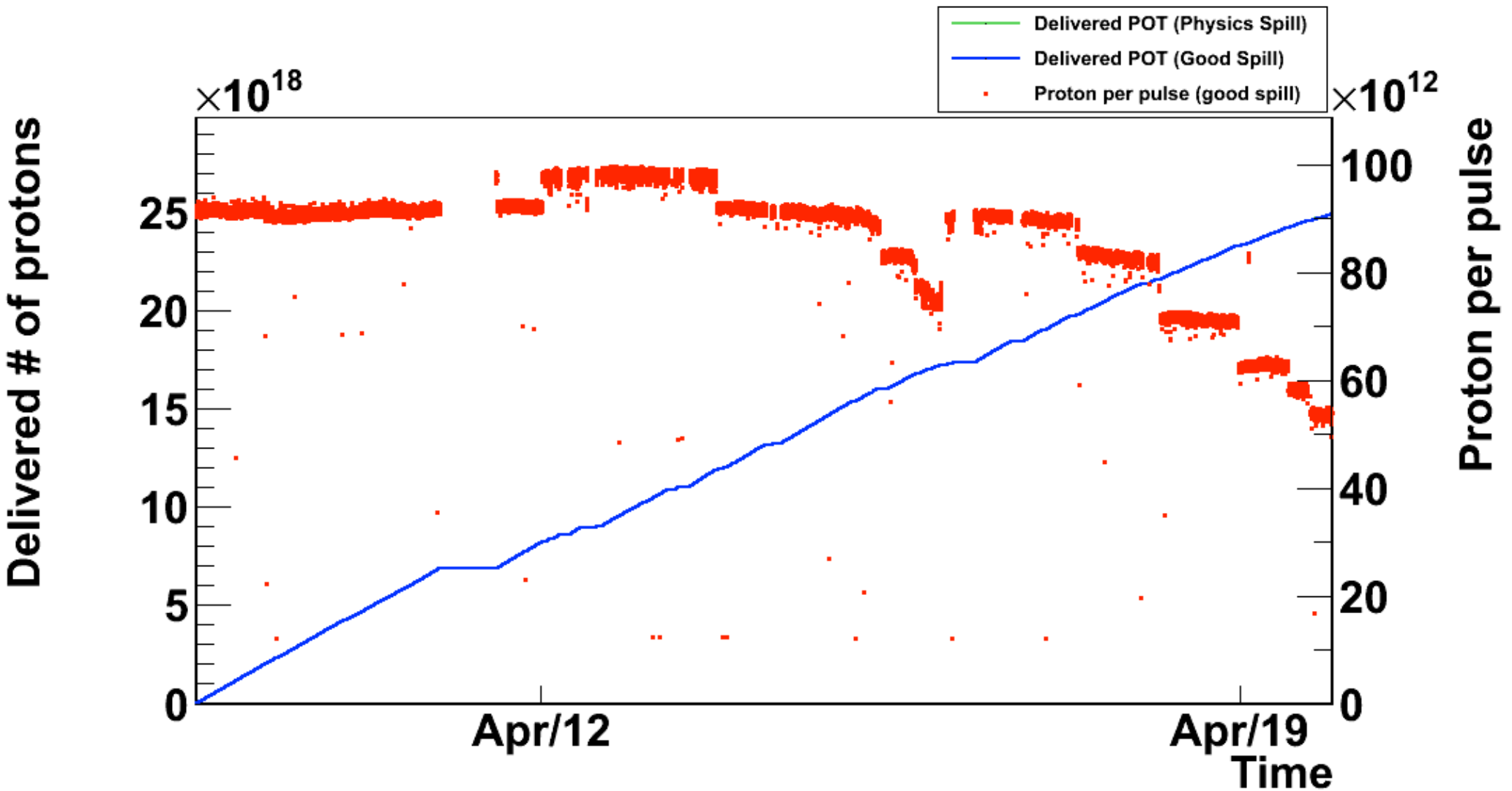
Run# 420022~420147

	# of spills	Ratio
Physics spills	294784	1
Beam trigger	289272	0.981
Good GPS	289272	0.981
ppp(CT5)>1e11	288939	0.980
Normal beam	288939	0.980
Horn cut	288939	0.980
MUMON cut	288924	0.980

# of delivered protons(CT5) after Good spill selection

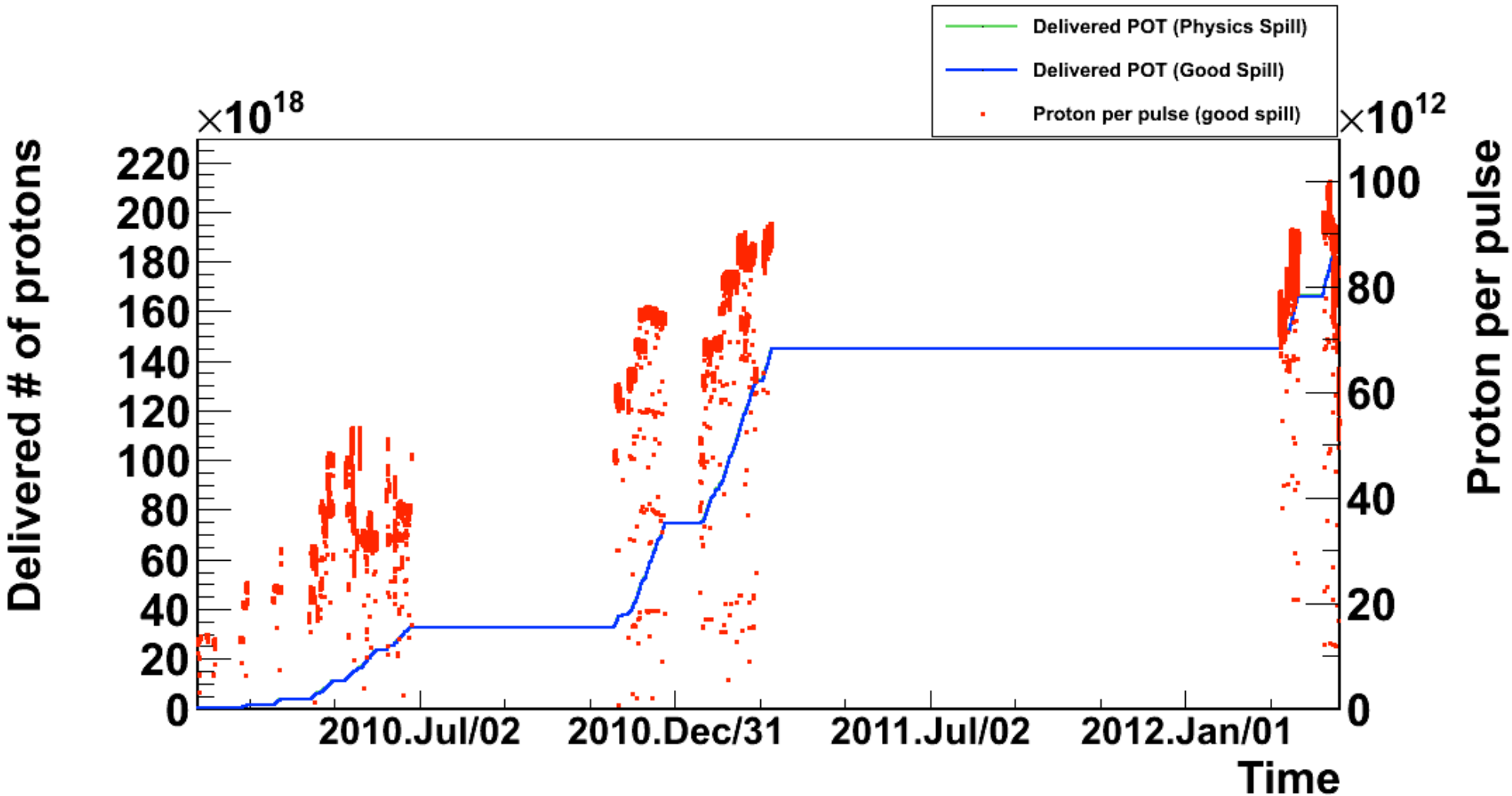
Integrated POT : 2.49 e+19

Integrated POT (RUN3c)



Integrated POT : 2.49 e+19

Integrated POT (so far)



Integrated POT (so far) reached to 1.91e+20

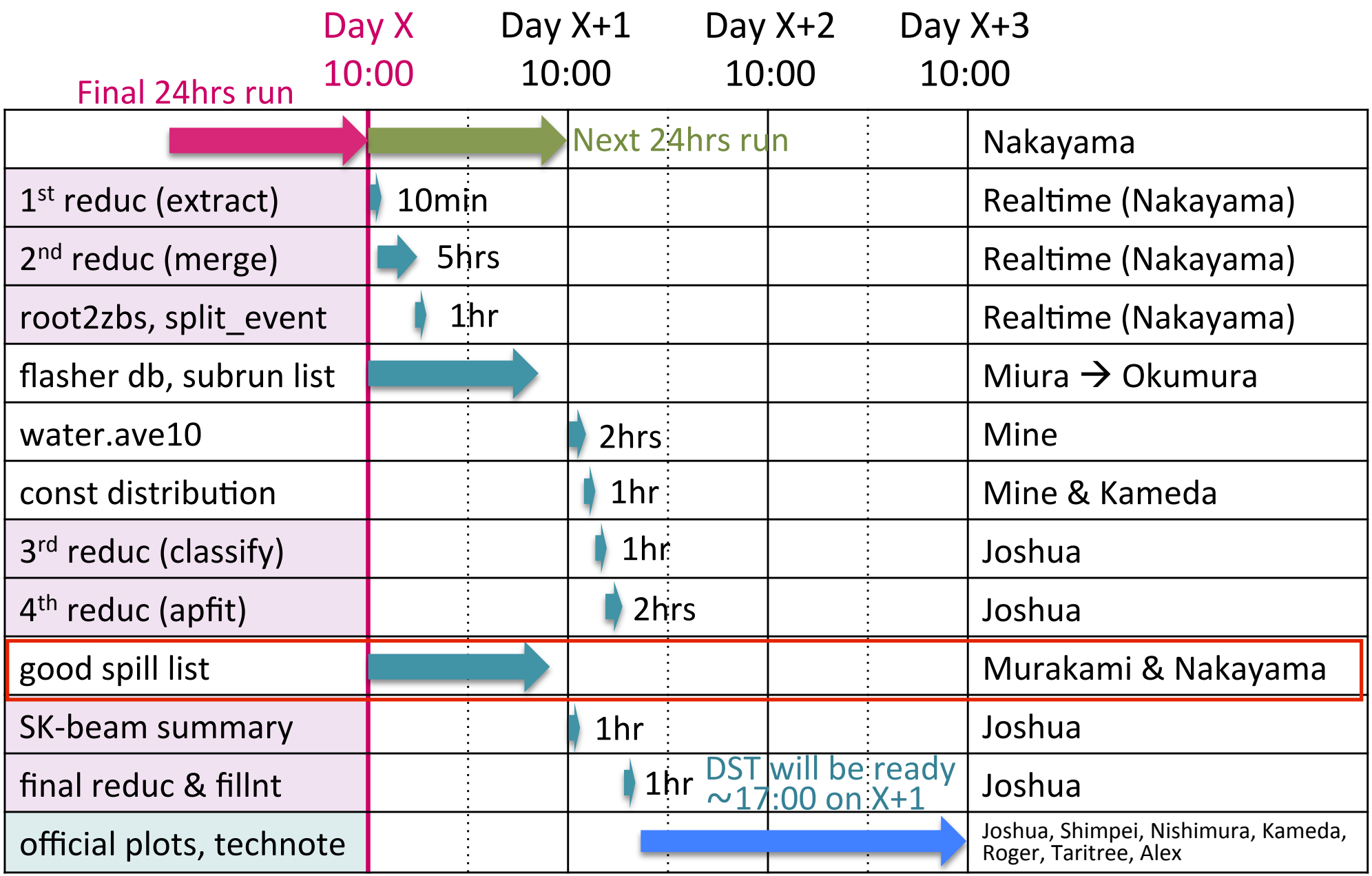
Summary

- We can start the physics run at 250 kA horn current.
- Integrated POT (so far) reach to 1.91 e+20.
- There are some bad spills in RUN3b and RUN3c, but beam operation has been stable.
  - In RUN3b, 3 bad spills failed by horn current cut
    - There was a spike around the peak of horn current shape and the fitting to the shape was not good (→ back up).
  - In RUN3c, 15 bad spills failed by MUMON cut
    - Now investigate this reason (→ back up).

Release plan for neutrino 2012 analysis

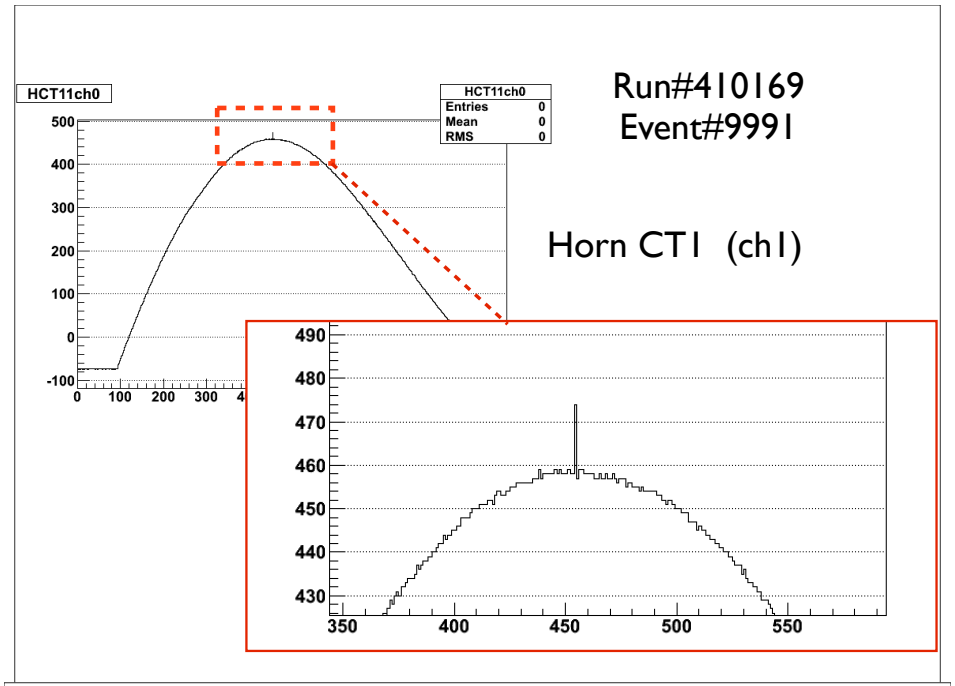
- Regular release schedule : after every beam group meeting
- Special release schedule : Apr/25, May/15
  - Use beam data until the these days (Apr/25, May/15) and release beam summary by14:00 at Next day (Apr/26, May/16)

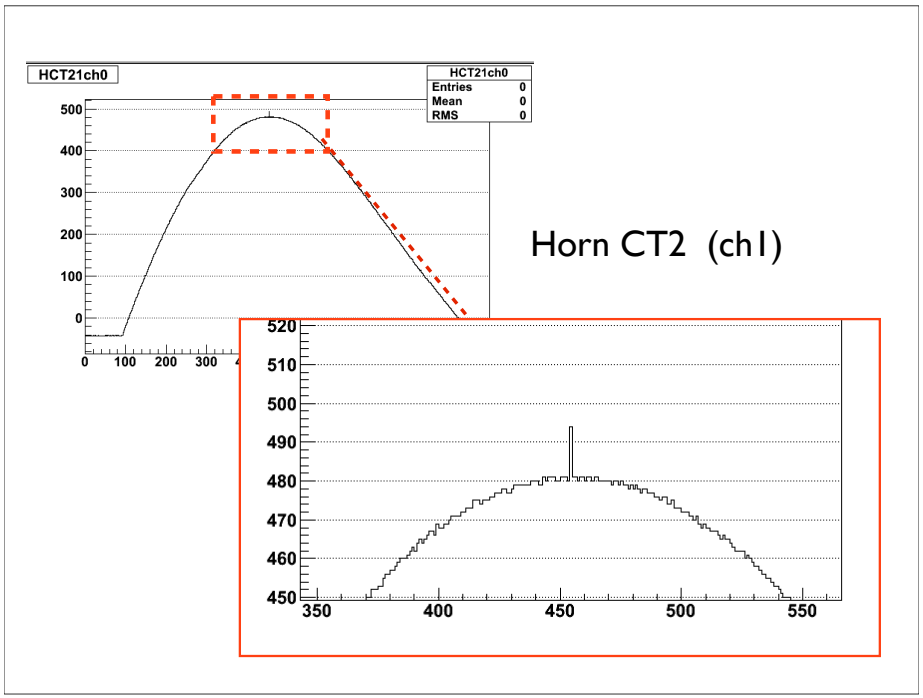
Schedule

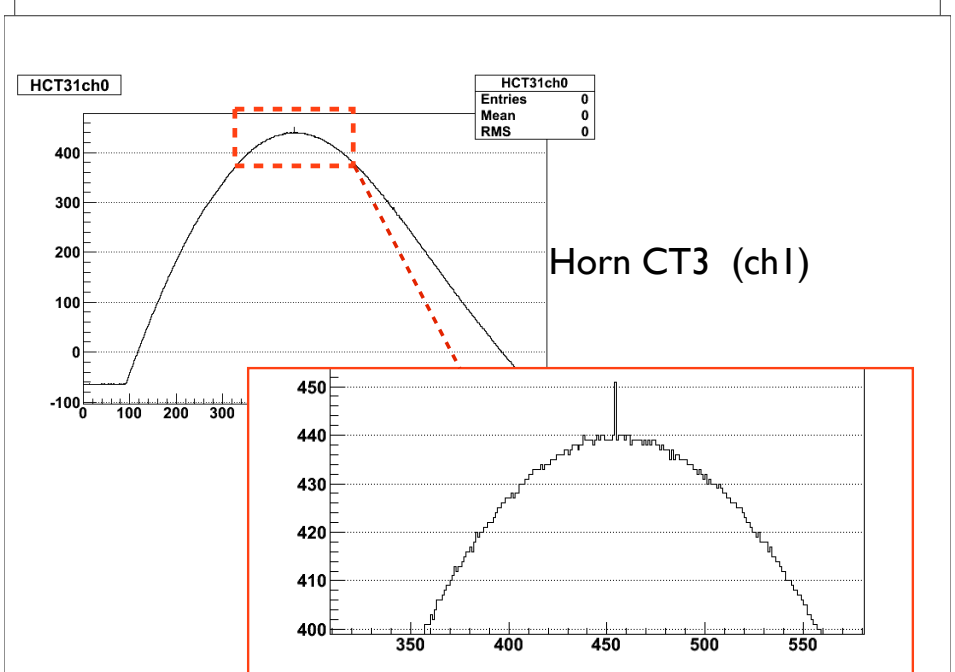

Day X
10:00
Day X+1
10:00
Day X+2
10:00
Day X+3
10:00
Final 24hrs run
Next 24hrs run
Nakayama
1st reduc (extract)
10min
Realtime (Nakayama)
2nd reduc (merge)
5hrs
Realtime (Nakayama)
root2zbs, split_event
1hr
Realtime (Nakayama)
flasher db, subrun list
Miura → Okumura
water.ave10
2hrs
Mine
const distribution
1hr
Mine & Kameda
3rd reduc (classify)
1hr
Joshua
4th reduc (apfit)
2hrs
Joshua
good spill list
Murakami & Nakayama
SK-beam summary
1hr
Joshua
final reduc & fillnt
1hr
DST will be ready
~17:00 on X+1
Joshua
official plots, technote
Joshua, Shimpei, Nishimura, Kameda,
Roger, Taritree, Alex

Back up

FADC of Horn current (one of bad spills failed by horn current cut in RUN3b)







There is a spike around peak current

→ Issue bad fitting & horn current estimated larger.

Bad spills by MUMON SiQ / CT05 in RUN3c

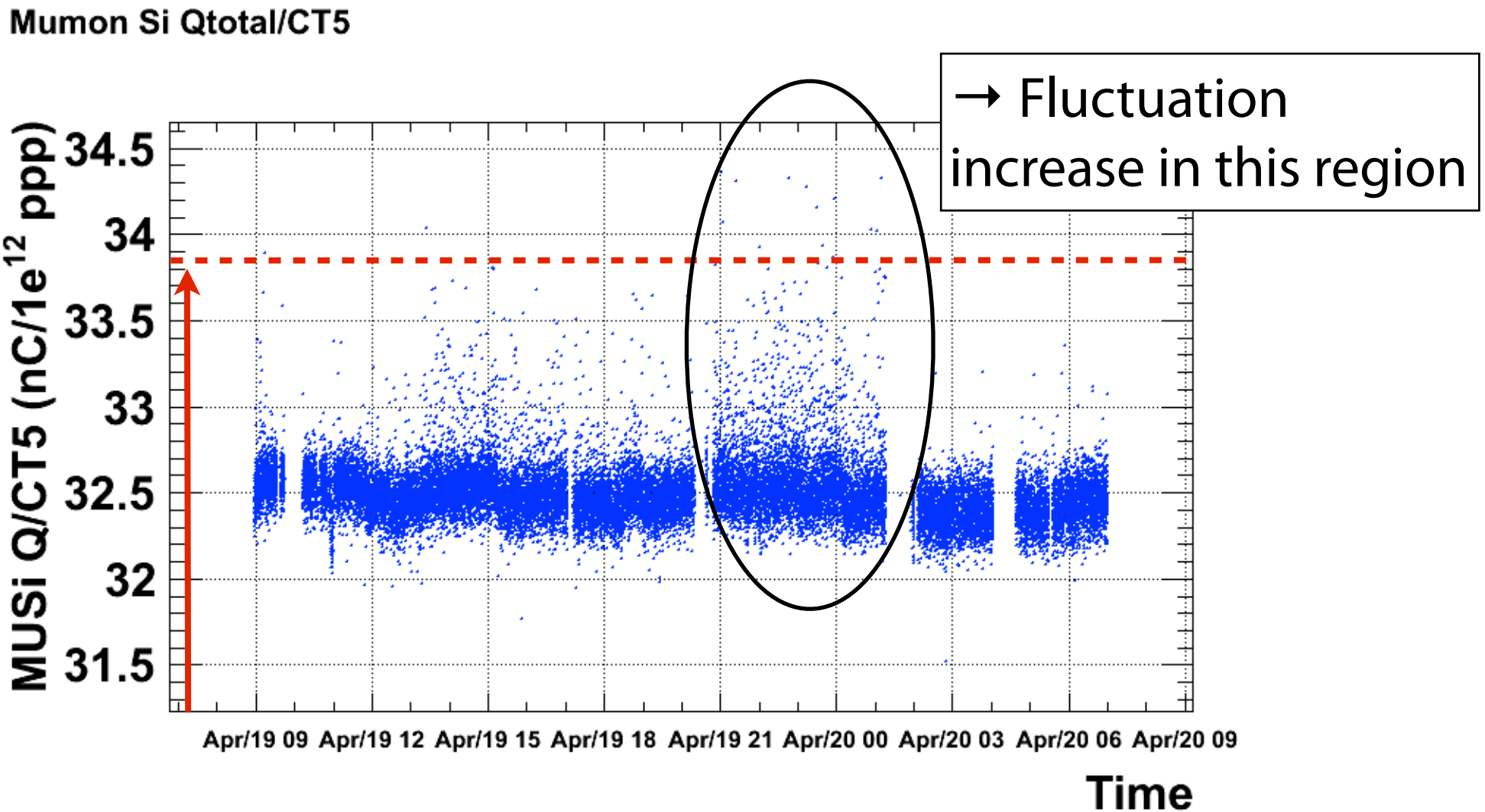
- Arrowed region of MUMON SiQ/ CT cut : 30.628 ~ 33.852 [nC/1e12ppp]

```
Run# Midas# Spill#
420129 399 2787394 : Bad spill due to si q/ct : 33.8941
420131 4245 2792766 : Bad spill due to si q/ct : 34.0369
420133 282 2802552 : Bad spill due to si q/ct : 34.3632
420133 365 2802635 : Bad spill due to si q/ct : 34.0714
420133 842 2803112 : Bad spill due to si q/ct : 34.3079
420133 1663 2803933 : Bad spill due to si q/ct : 33.9289
420133 2736 2805006 : Bad spill due to si q/ct : 34.3291
420133 3397 2805667 : Bad spill due to si q/ct : 34.2762
420133 3744 2806014 : Bad spill due to si q/ct : 34.1580
420133 3975 2806245 : Bad spill due to si q/ct : 33.9332
420133 4359 2806629 : Bad spill due to si q/ct : 33.8676
420133 4409 2806679 : Bad spill due to si q/ct : 34.2070
420133 5709 2807979 : Bad spill due to si q/ct : 34.0246
420133 5893 2808163 : Bad spill due to si q/ct : 34.0234
420133 6067 2808337 : Bad spill due to si q/ct : 34.3270
```

MUMON Si Q / CT (around bad spills)

- Use Run# 420129~420136

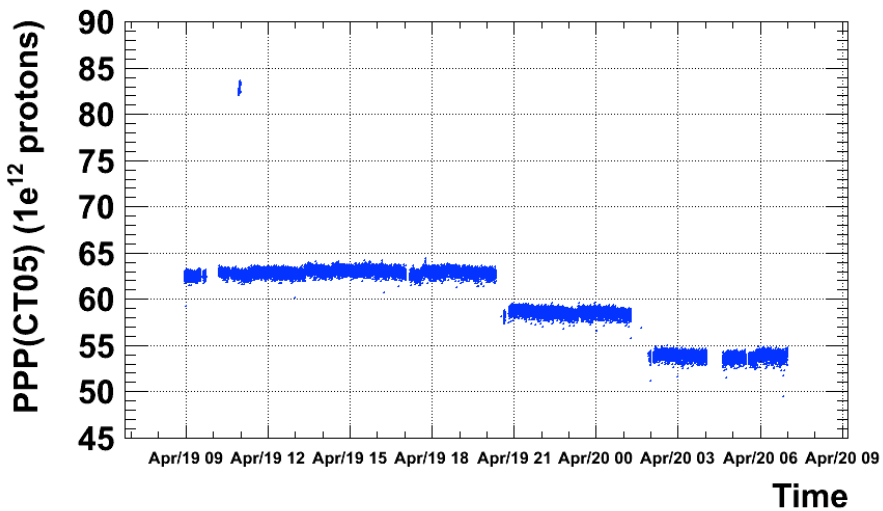
30.628 ~ 33.852



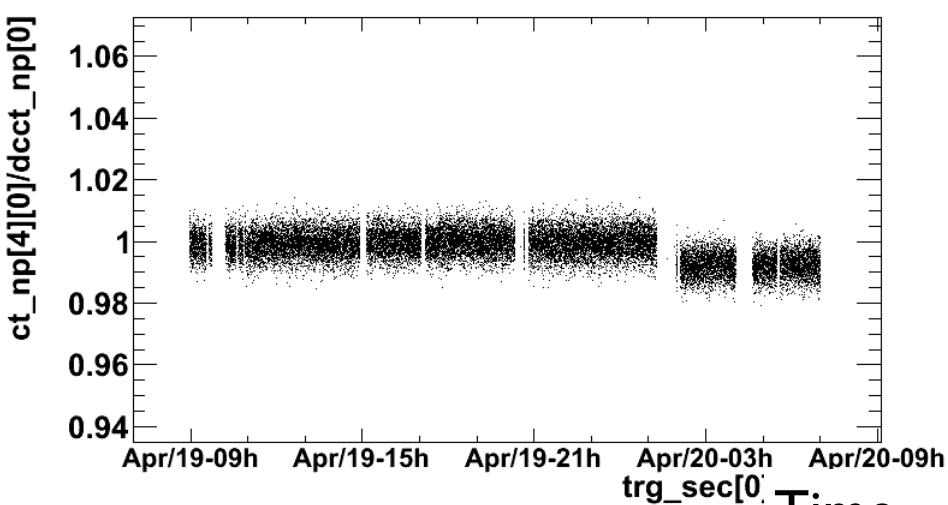
MUMON SiQ, PPP (around bad spills)

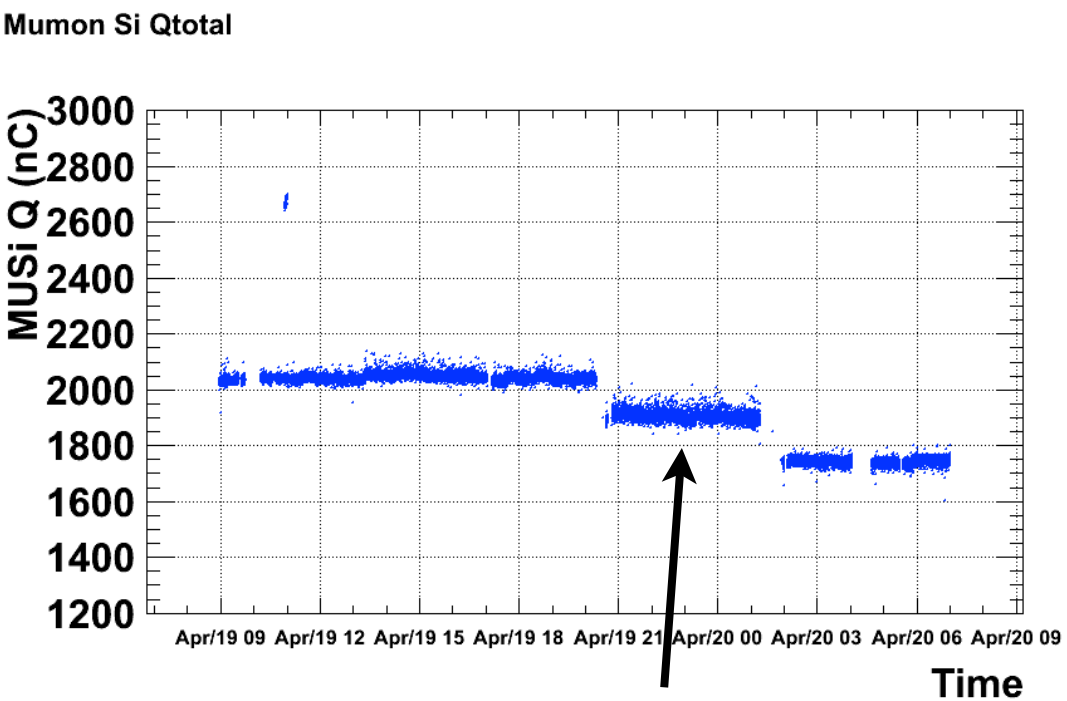
- Use Run# 420129~420136

Proton per pulse (CT05)



Proton per pulse ratio of CT05/DCCT



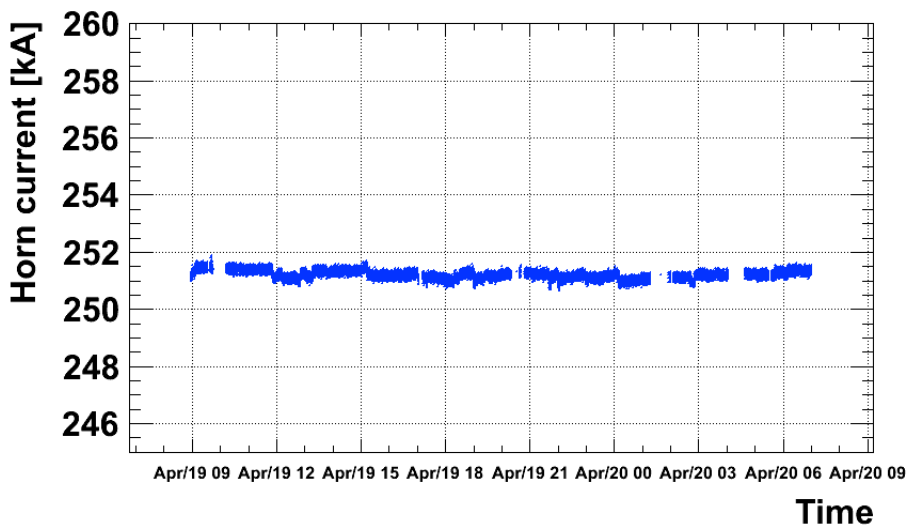


MUMON SiQ sometimes increased around bad spills

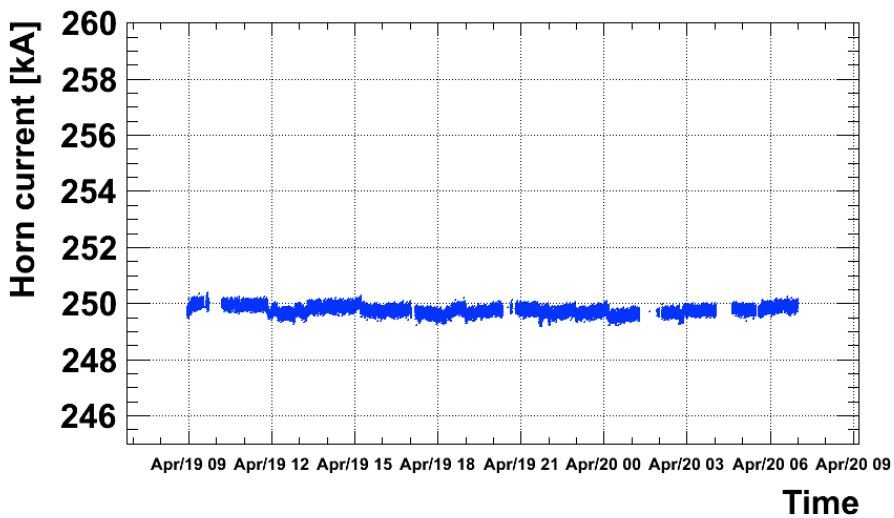
Horn current (around bad spills)

- Use Run# 420129~420136

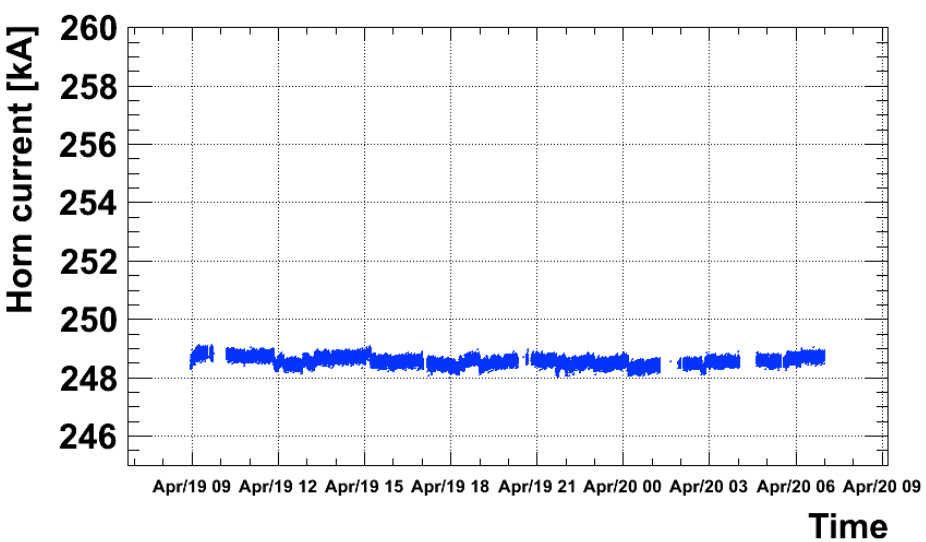
Horn1 current



Horn2 current



Horn3 current



All Horn current are stable (no bad spill)