GPS report

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- 2010年からのGPSデータを解析
  - GPS Status についてと、GPSモジュール間のトリガー時間差(deltaT)について
- 2010jan と2010mar に分けて解析
  - このわけ方はjnulsv01データディレクトリの分け方に沿っただけ。

GPS error status

- “GPS Perfect Status” = GPS data exit & GPS sync ok & 1PPS in 100 nsec.
  - status code = 386 (0x182)
- Make two categories : “Not Good Status” and “Not Perfect Status”.
- “Not Good Status” : IsOKStat(). 上記のstatus bit のうち、一つのbitでも立っていない場合.
  - can be called “warning status”.
- “Not Perfect Status” : GPS status が上記のperfect statusではない場合

Perfect GPS status bit が立っている
その他のstatus bit は立っていない。
→ ALL OK

Perfect GPS status bit は立っている
その他の status bit (warning bit) 立っている。
→ Not all OK, warning

Perfect GPS status bit のうち、一つのstatus bit でも立っていない。
→ Not Good

2010 jan

comment

- Total entry is 793632
  - GPS trouble happened
    - Data of GPS (status, spill#) is not correct.
  - All module was restart → recovered

GPS trouble

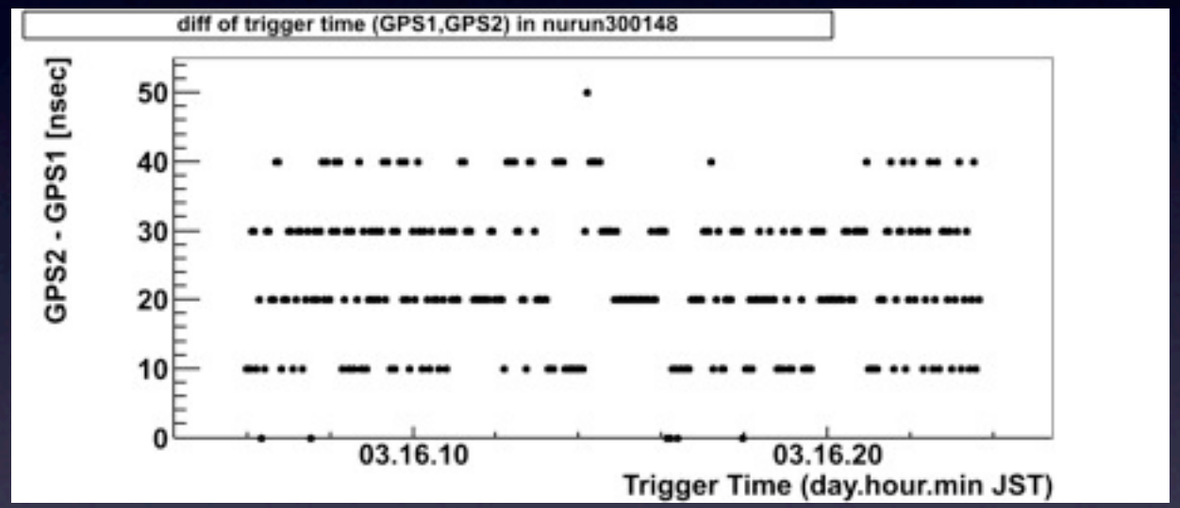
- deltaT is too large in nurun 300147, 300149
  - need to check this run is GPS trouble run ?

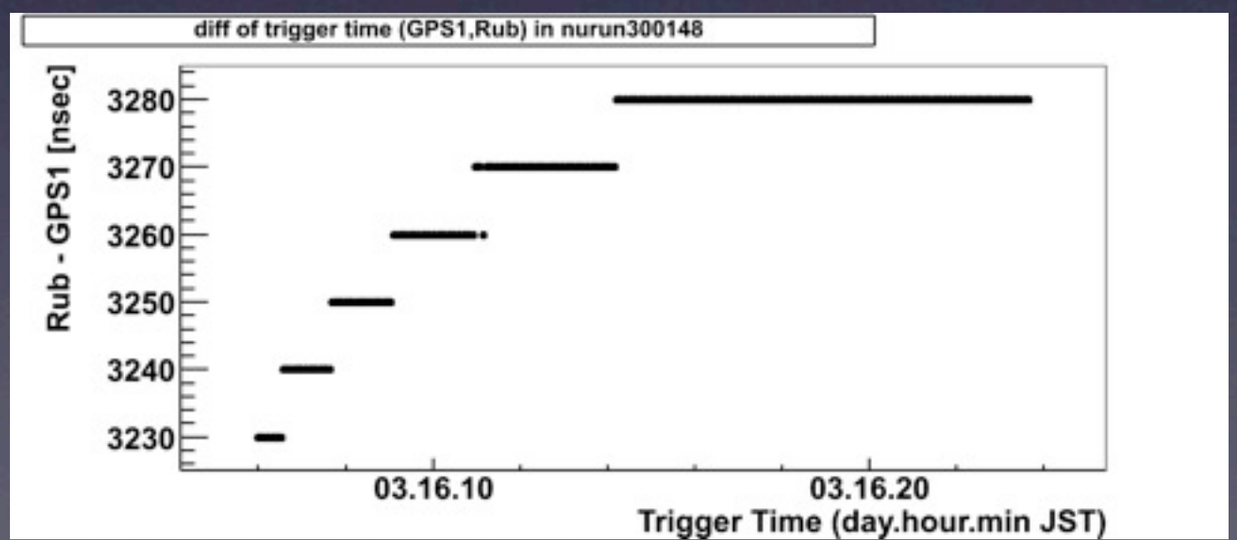
Row	Instance	nurun	spillnum	gps_stat	deltaT
626371	1	300147	1180	386	-50326930
626372	1	300147	1181	390	-50326930
627408	0	300147	2010	430	-99999987
627408	1	300147	2010	430	-99999989
627409	0	300147	21660156	430	-99999988
627409	1	300147	21660156	430	-99999990
627410	0	300147	26018053	414	-99999988
627410	1	300147	26018053	430	-99999990
627411	0	300147	21660156	442	-99999988
627411	1	300147	21660156	430	-99999990

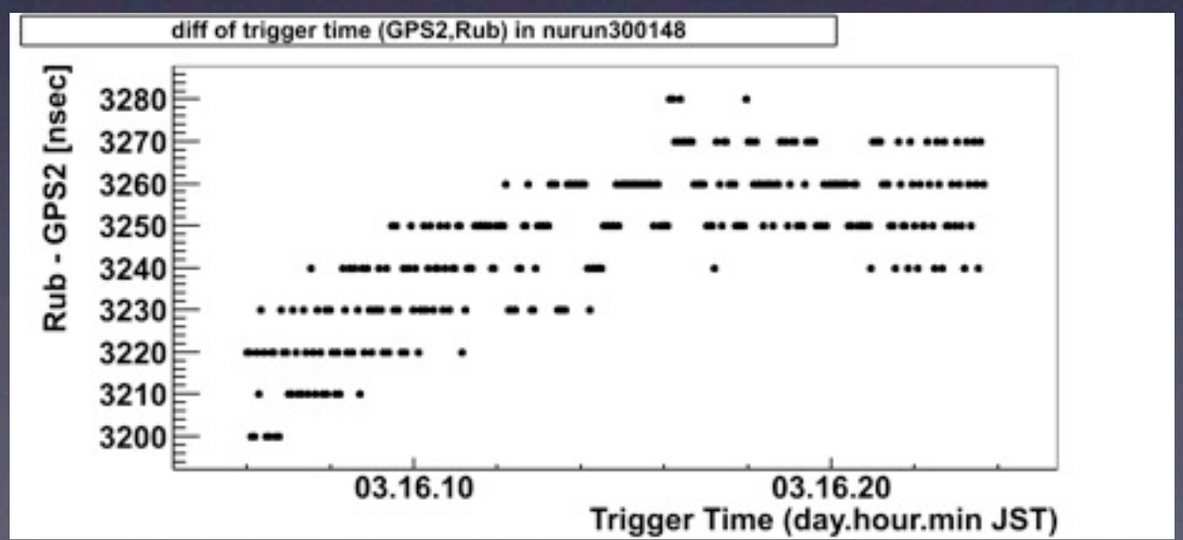
- categorized “gps trouble run”.

GPS trouble

- in nurun = 300148, gps status is perfect
- trigger time by Rub atomic clock is not normally.
  - just after restart, Rub clock is not stable ?

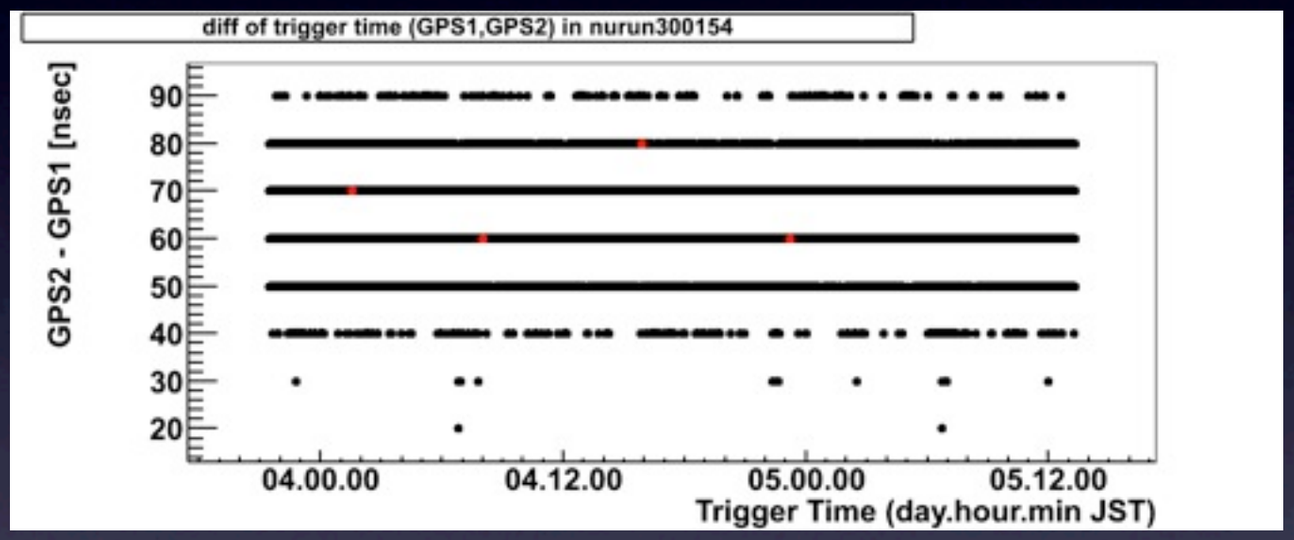




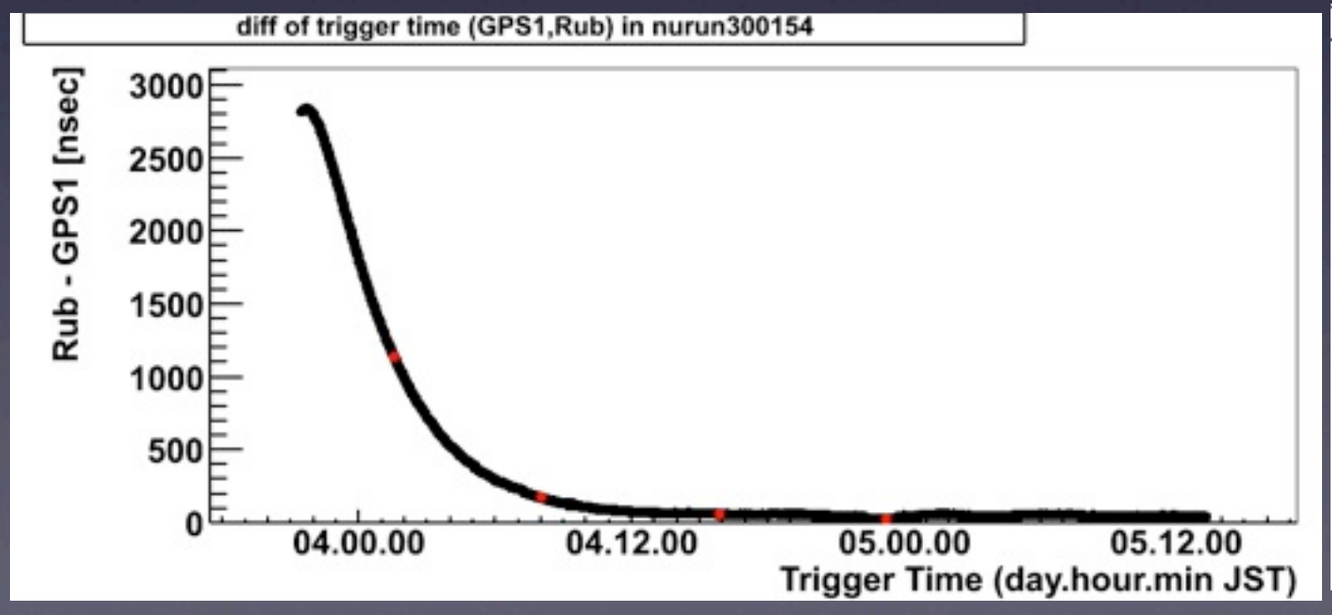


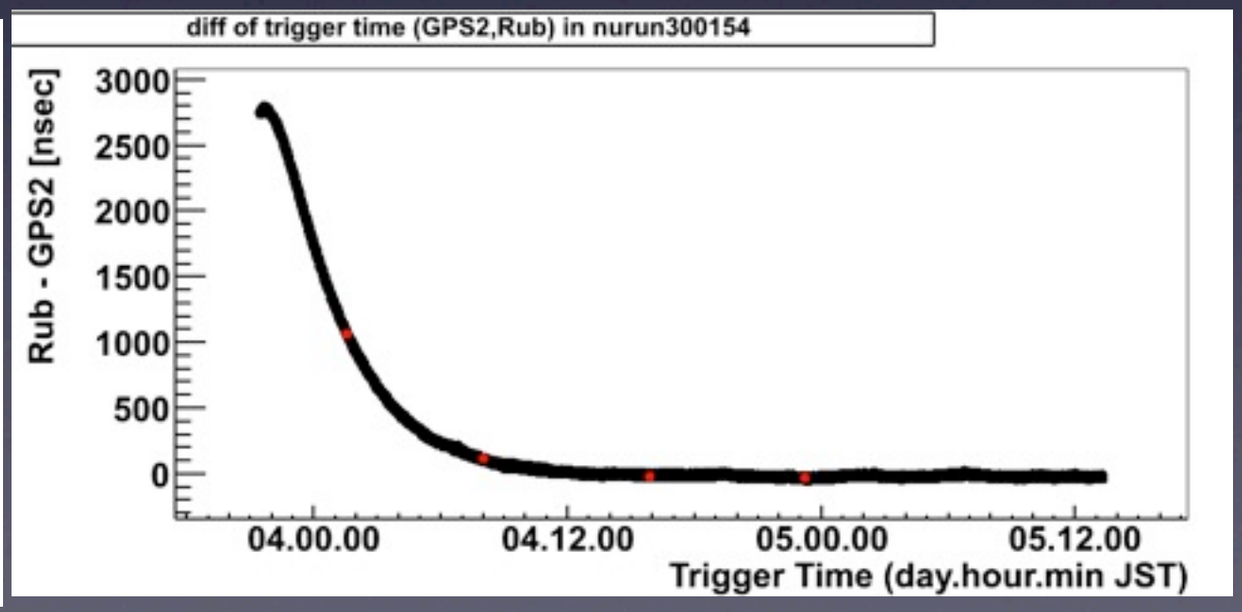
After resolve GPS trouble

- In nurun = 300154
- Rub clock going to stable.

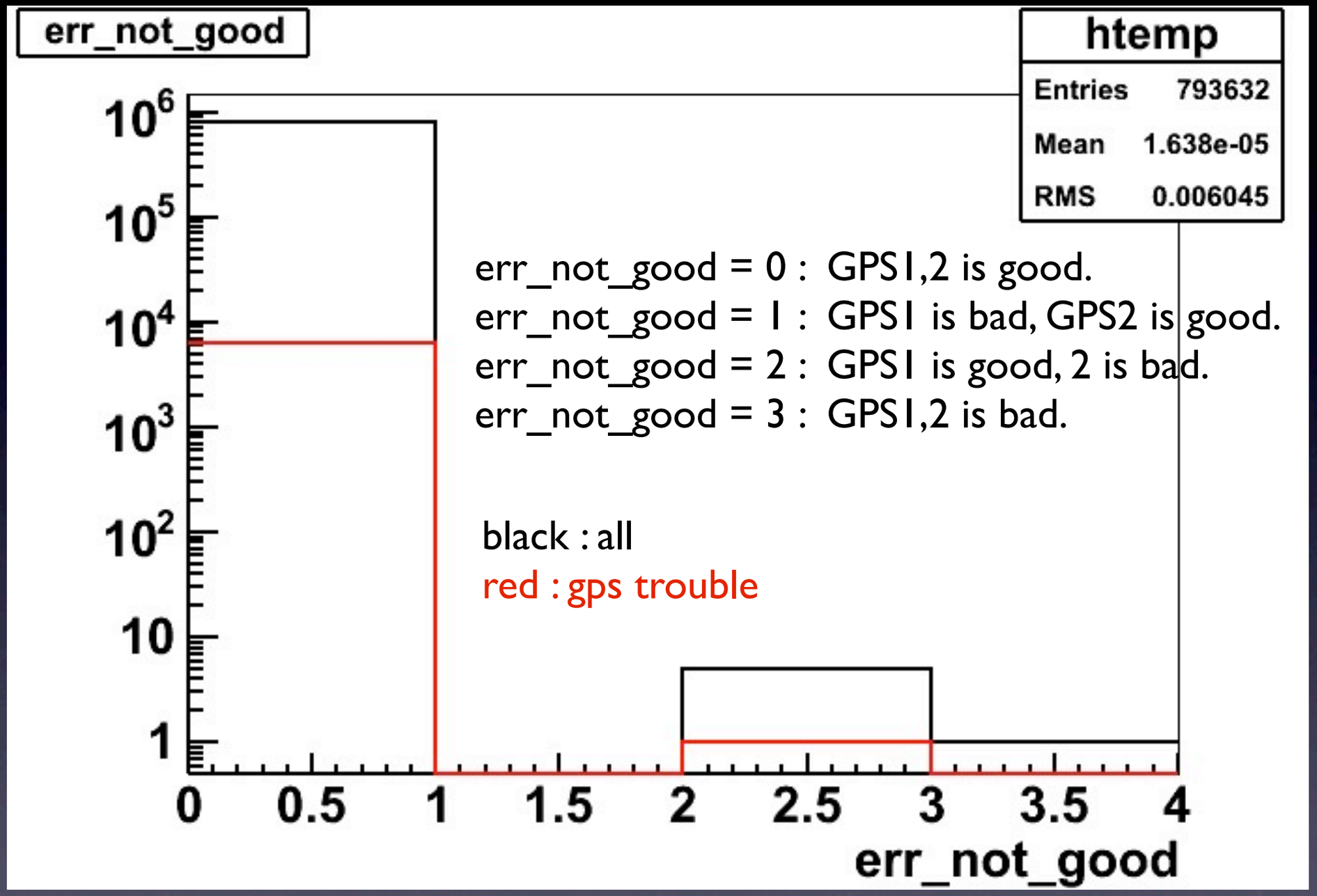


black point : all
red point : GPS2 status is warning





Not good status



At some events, GPS status is not Good

→ Show detail...

err_not_good == 2

5 events

```
anagps->Scan("nurun:gps_stat:deltaT","err_not_good==2")
************************************************************
*    Row   * Instance *     nurun *  gps_stat *    deltaT *
************************************************************
*    66889 *        0 *    290098 *       386 *       100 *
*    66889 *        1 *    290098 *       130 *       100 *
*    66889 *        2 *    290098 *           *         0 *
*   184844 *        0 *    290169 *       386 *       100 *
*   184844 *        1 *    290169 *       130 *       100 *
*   184844 *        2 *    290169 *           *         0 *
*   414204 *        0 *    290200 *       386 *        70 *
*   414204 *        1 *    290200 *       130 *       100 *
*   414204 *        2 *    290200 *           *        30 *
*   438533 *        0 *    290201 *       386 *        60 *
*   438533 *        1 *    290201 *       130 *       110 *
*   438533 *        2 *    290201 *           *        50 *
*   624962 *        0 *    300147 *       386 *       130 *
*   624962 *        1 *    300147 *      2238 *       110 *
*   624962 *        2 *    300147 *           *       -20 *
************************************************************
```

Only about deltaT, GPS module worked normally .....

err_not_good == 3

1 events

```
root [53] anagps->Scan("nurun:gps_stat:deltaT","err_not_good==3")
   ************************************************************
   *    Row   * Instance *     nurun *  gps_stat *    deltaT *
   ************************************************************
   *   624777 *        0 *    300144 *      2198 *       110 *
   *   624777 *        1 *    300144 *      2238 *       100 *
   *   624777 *        2 *    300144 *           *       -10 *
   ************************************************************
```

Only about deltaT, GPS module worked normally .....
need check this nurun is physics run.

error code of err_not_good

error code	detail of code	nurun
GPS2 130 (0x82)	GPS_DATA_EXIT & GPS_SYNC_OK	290098, 290169, 290200, 290201

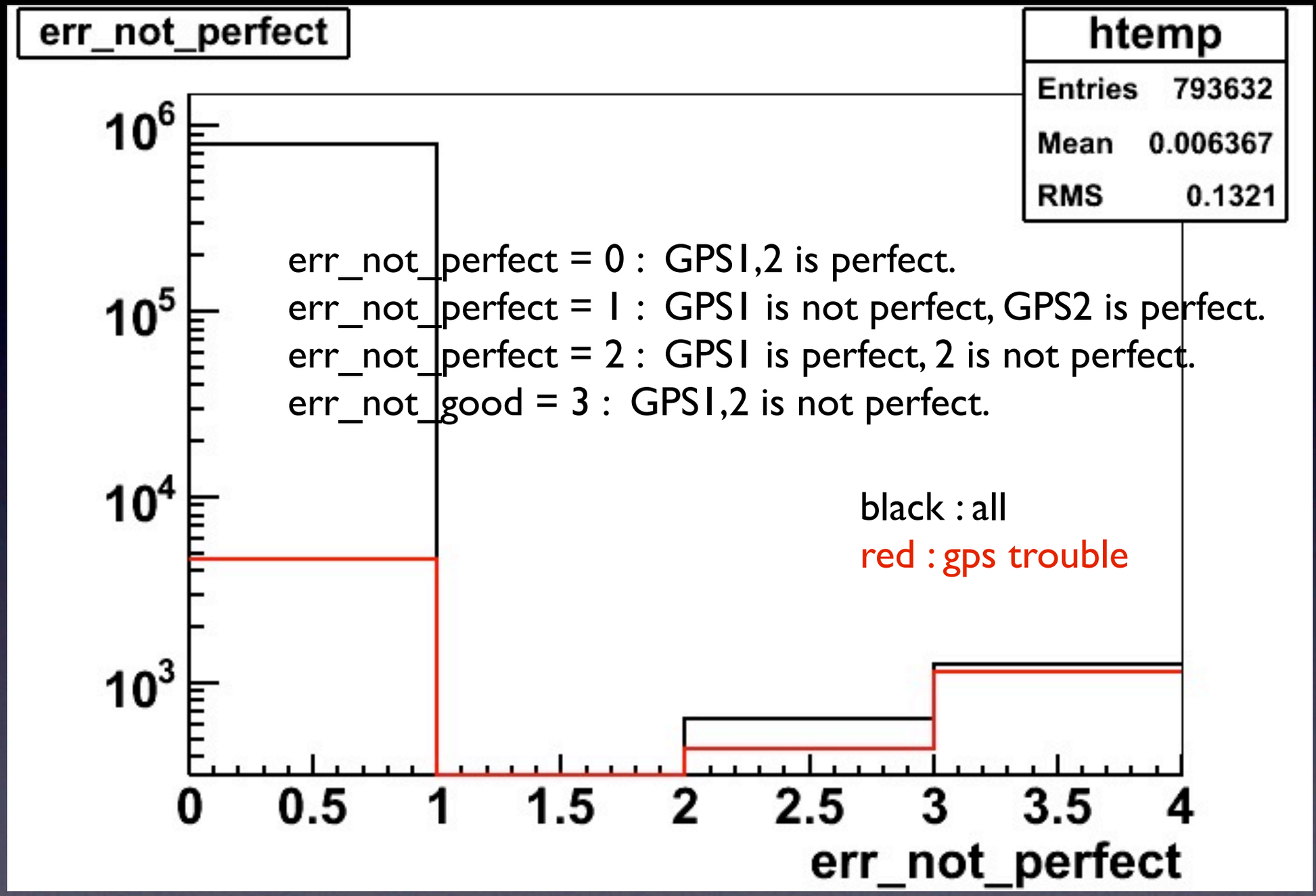
→ GPS 1PPS の間隔に関する情報がない(bitが立っていない)

error code	detail of code	nurun
GPS1 2198 (0x896)	GPS_1PPS_GT_1000NS & GPS_1PPS_SKIP & GPS_TIME_INC_BAD & GPS_SYNC_OK & GPS_DATA_EXITS	300144
GPS2 2238 (0x8be)	GPS_1PPS_GT_1000NS & GPS_REQUIRE_CORRECT & GPS_CPU_TIME_DIFF_BAD & GPS_TIME_INC_BAD & GPS_DATA_EXIT & GPS_SYNC_OK	300144

→ GPS 1PPS の間隔が1000nsec以上であると言っている。

→ nurun=300144はGPS trouble 中

Not perfect status



GPS1:not_perfect (exclude nurun 300147,300149)

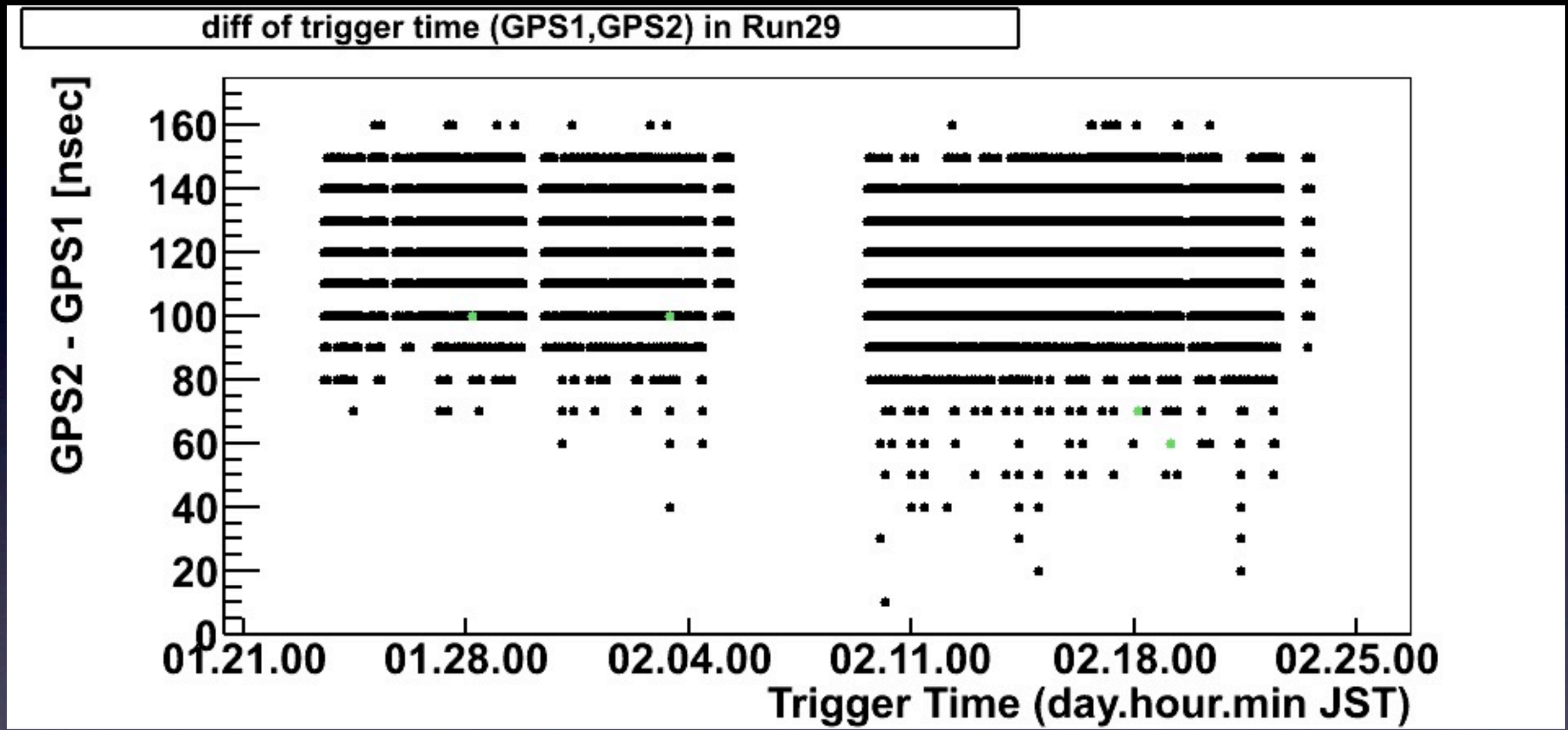
code	detail (other from Perfect)	#	%
390 (0x186)	GPS_TIME_INC_BAD	43	0.00546
394 (0x18a)	GPS_CPU_TIME_DIFF_BAD	11	0.0014
398 (0x18e)	GPS_TIME_INC_BAD, GPS_CPU_TIME_DIFF_BAD	13	0.00165
402 (0x192)	GPS_TIME_INC_BAD, GPS_1PPS_SKIP	1	0.00013
410(0x19a)	GPS_CPU_TIME_DIFF_BAD, GPS_1PPS_SKIP	2	0.00025
414 (0x19e)	GPS_TIME_INC_BAD, GPS_CPU_TIME_DIFF_BAD, GPS_1PPS_SKIP	27	0.00343
418 (0x1a2)	GPS_REQUIRE_CORRECT	2	0.00025
422 (0x1a6)	GPS_TIME_INC_BAD, GPS_REQUIRE_CORRECT	4	0.00051
430 (0x1ae)	GPS_TIME_INC_BAD, GPS_CPU_TIME_DIFF_BAD, GPS_REQUIRE_CORRECT	62	0.00787
446 (0x1be)	GPS_TIME_INC_BAD, GPS_CPU_TIME_DIFF_BAD, GPS_1PPS_SKIP, GPS_REQUIRE_CORRECT	11	0.0014

- GPS1 warning code が出ていたラン番号
- 300138 ~ 300146
- この間はGPSがトラブル中

deltaT

- check each MR run (Run29, Run30)
  - Run30は nurun = 300163 までのデータを用いた.
  - Run30は nurun = 300147, 300148, 300149, 300154のデータは省いた。
    - DeltaTが変に大きすぎるため(nurun=300147,300149).
    - Rubが安定していないため(nurun=300148, 300154)
      - 安定しているかどうかはDeltaTの値が一定かどうかで判断。

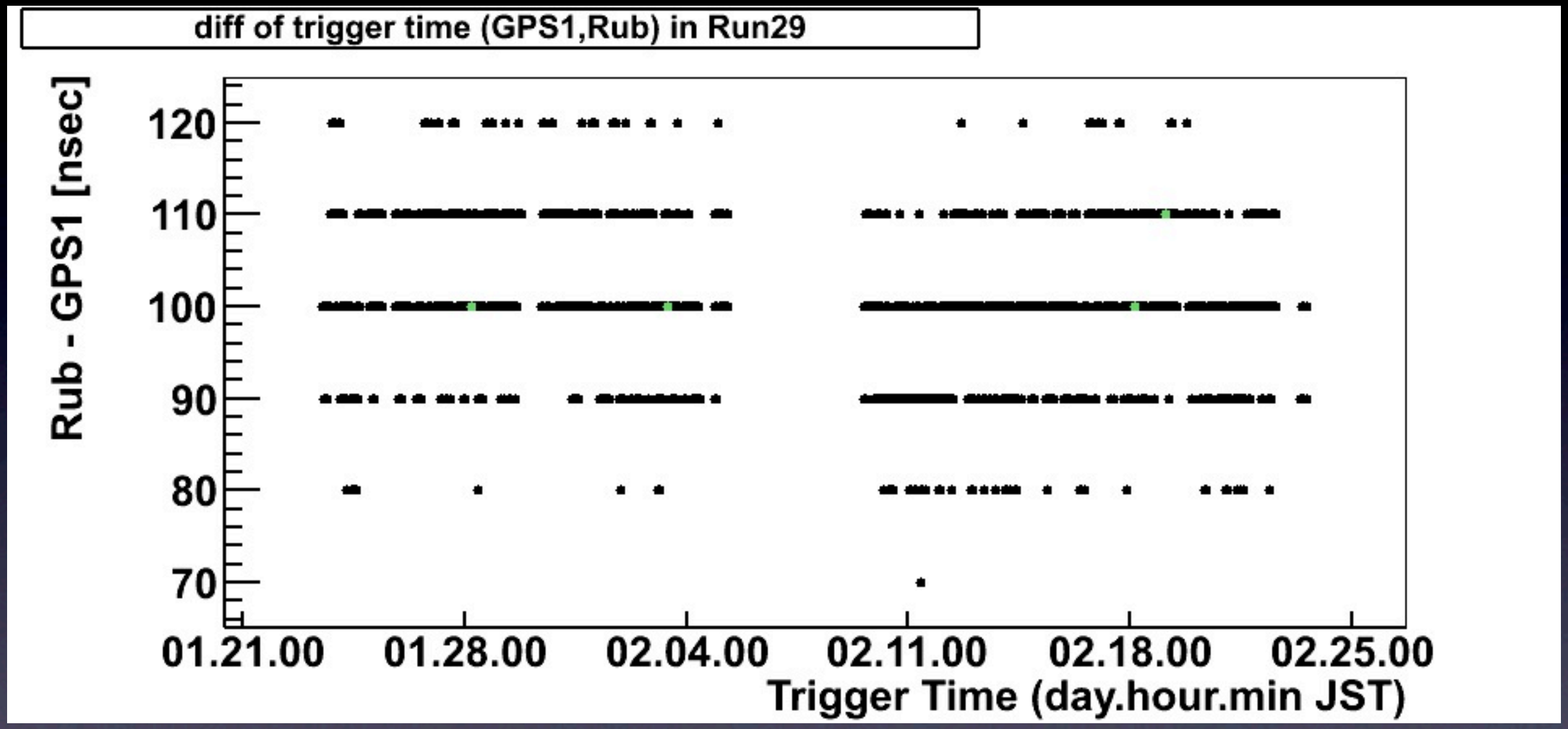
Run 29 (GPS2-GPS1)



black point : all

green point : GPS2 is not good status

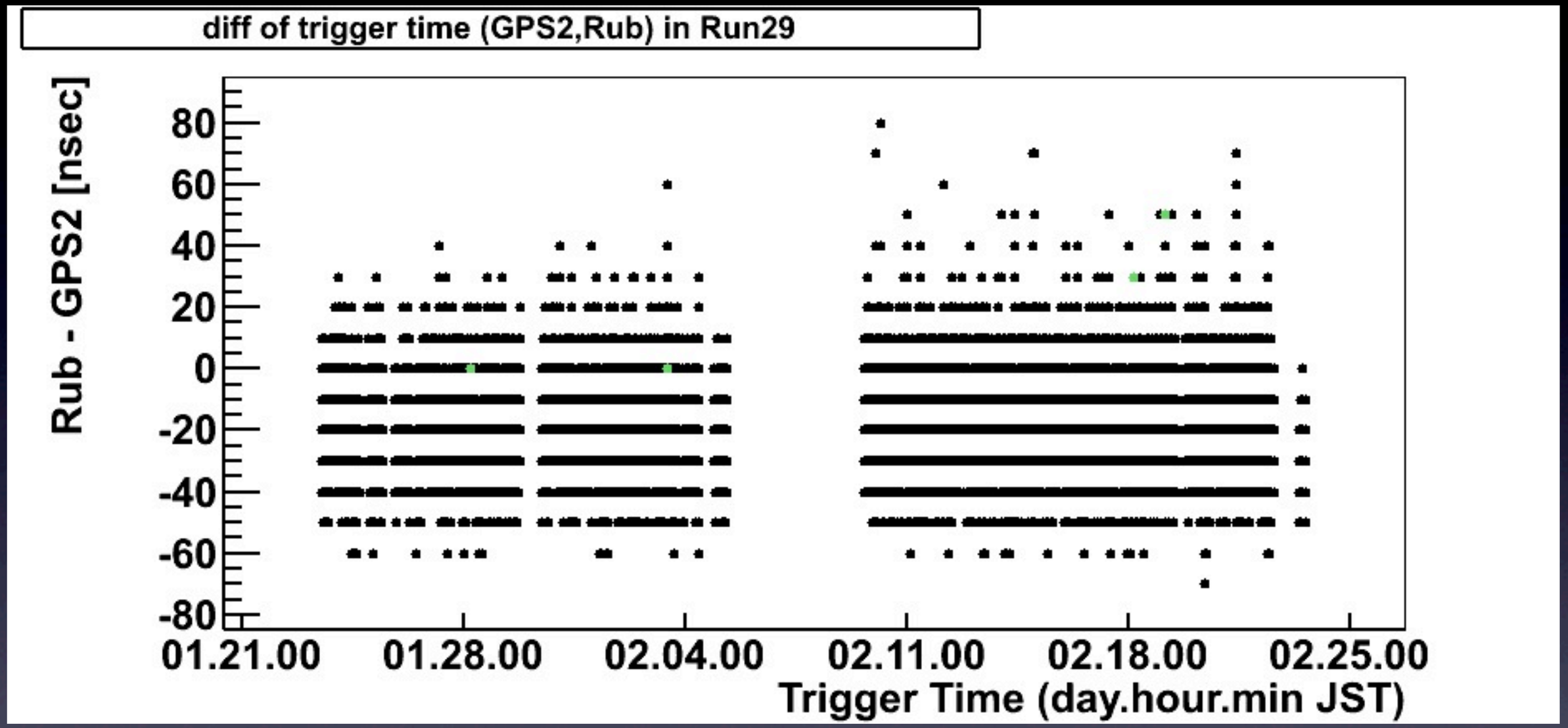
Run 29 (Rub-GPS1)



black point : all

green point : GPS2 is not good status

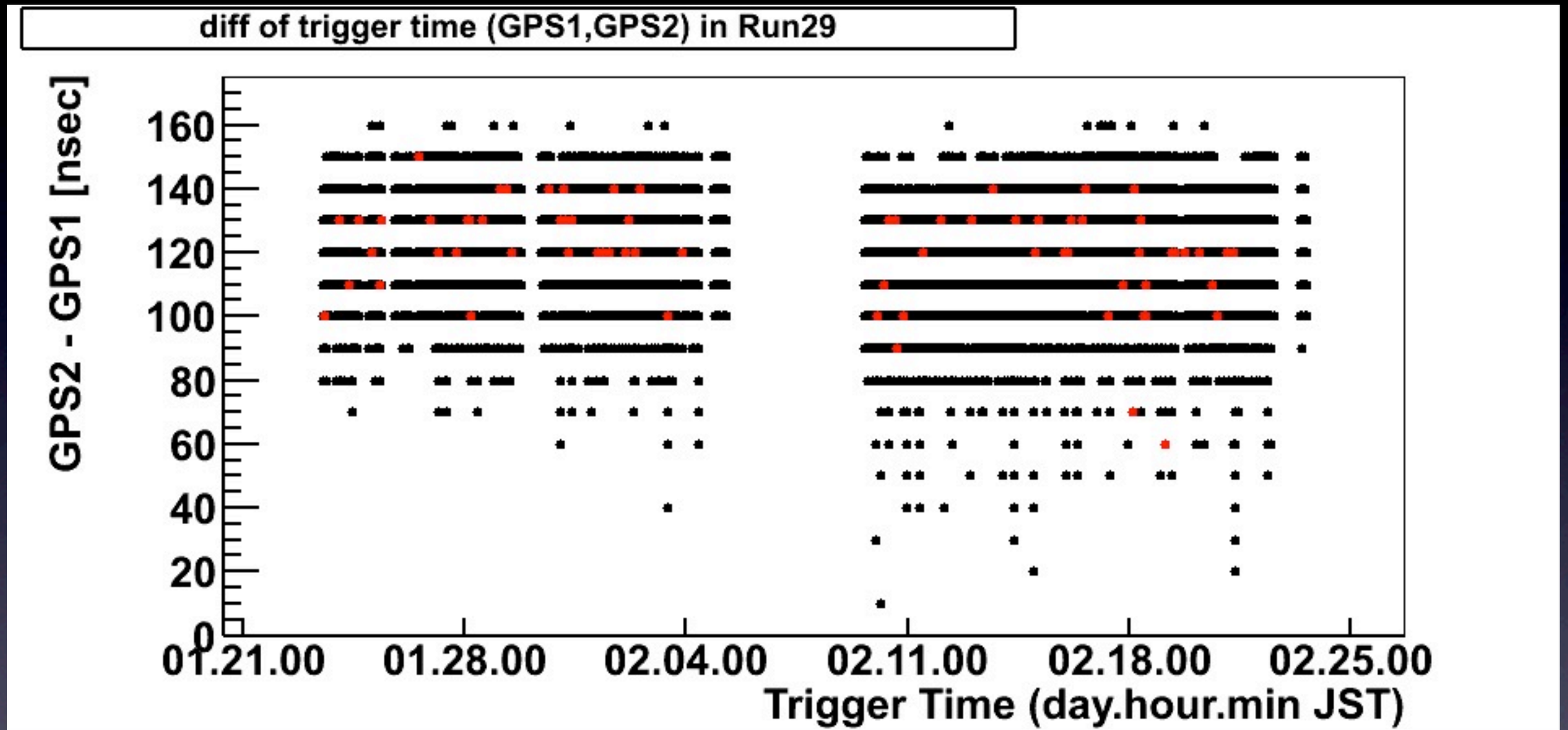
Run 29 (Rub-GPS2)



black point : all

green point : GPS2 is not good status

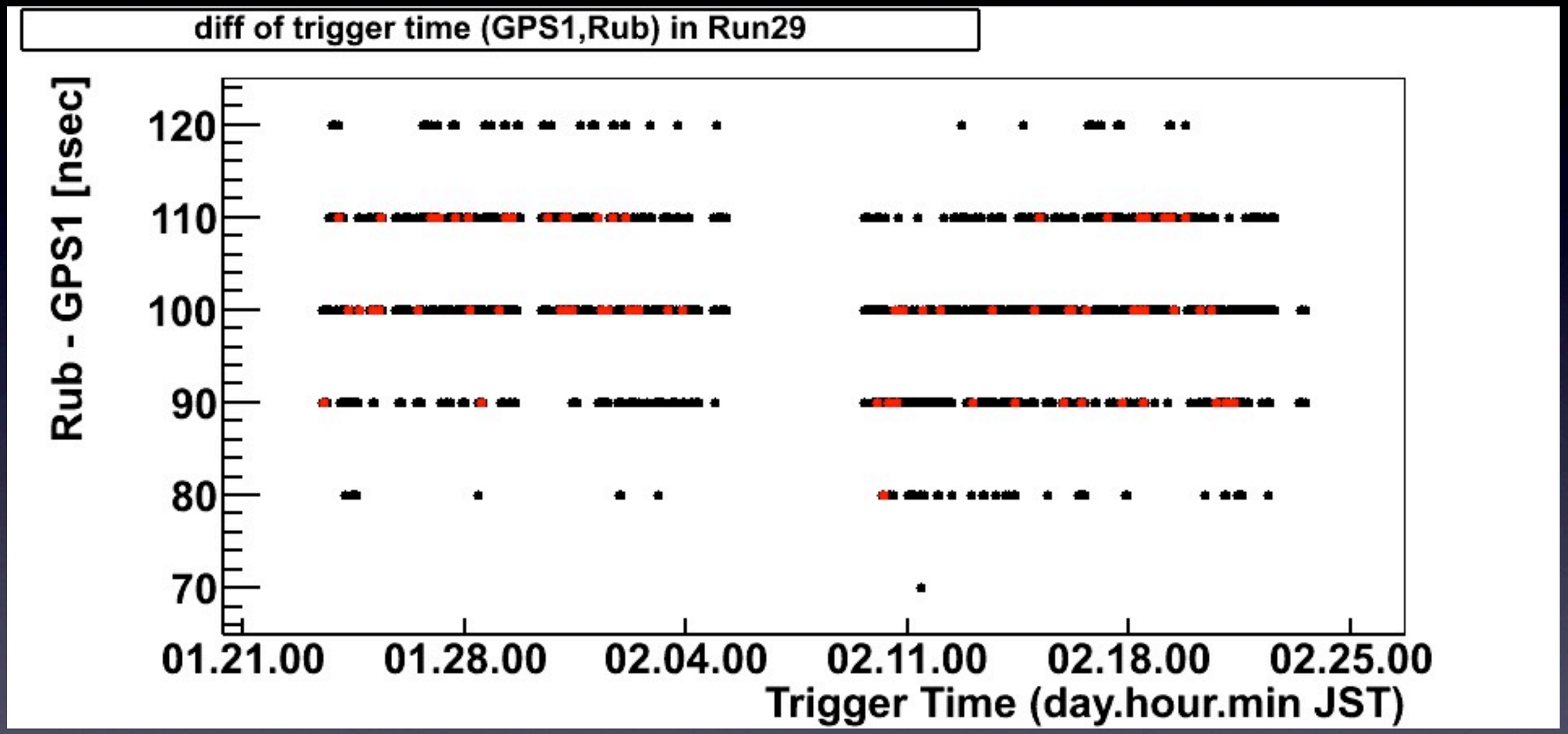
Run 29 (GPS2-GPS1)



black point : all

red point : GPS2 is not perfect status (is warning status)

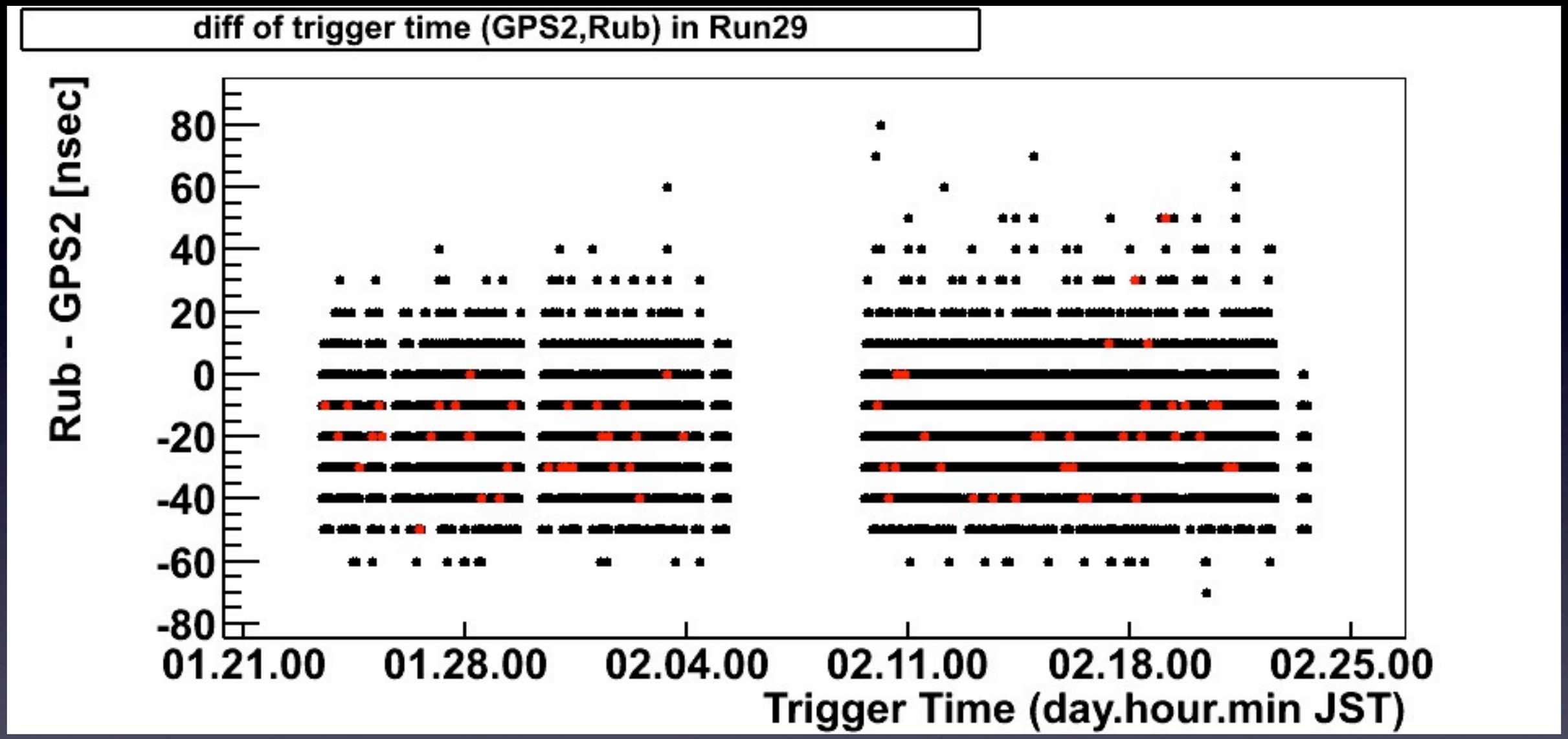
Run 29 (Rub-GPS1)



black point : all

red point : GPS2 is not perfect status (is warning status)

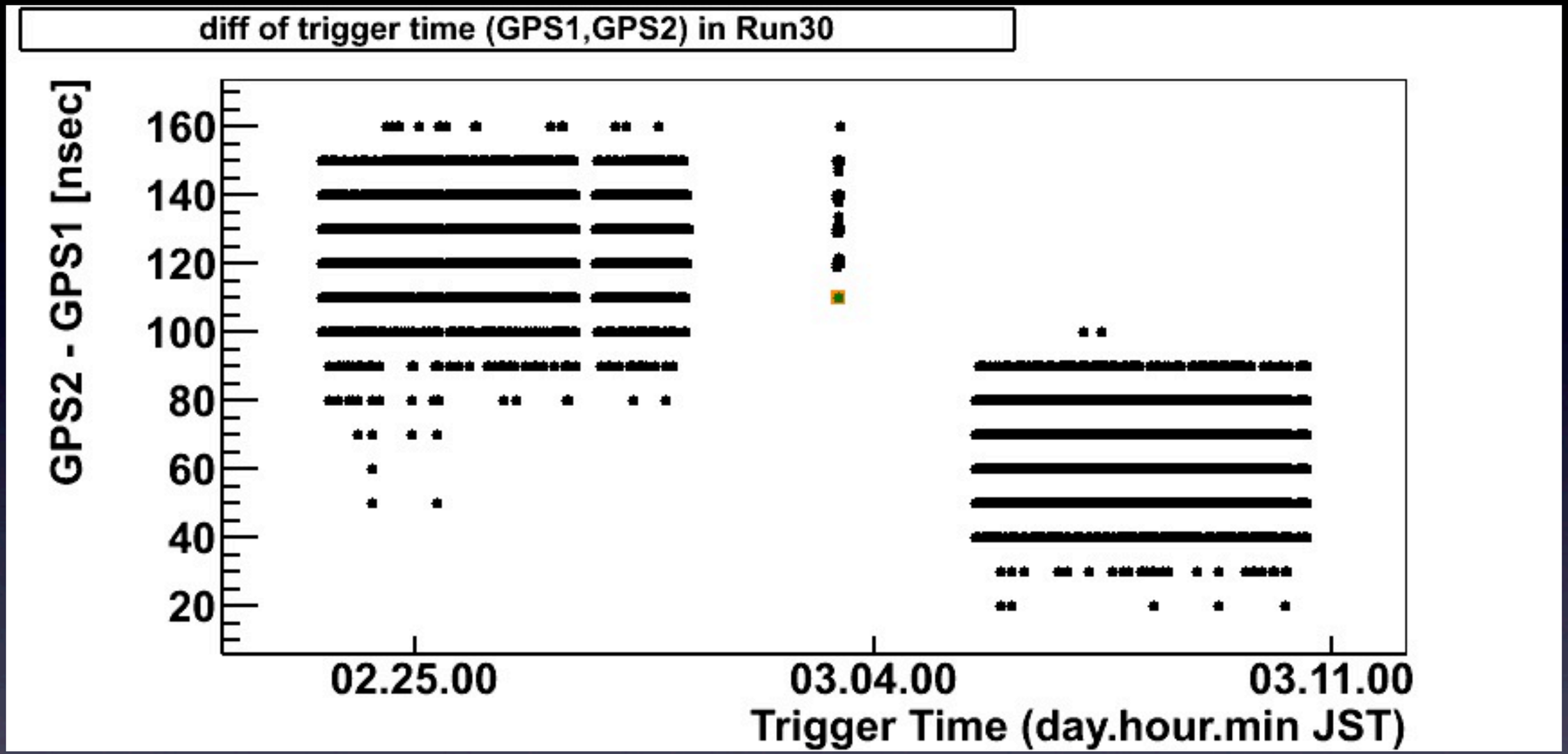
Run 29 (Rub-GPS2)



black point : all

red point : GPS2 is not perfect status (is warning status)

Run 30 (GPS2-GPS1)

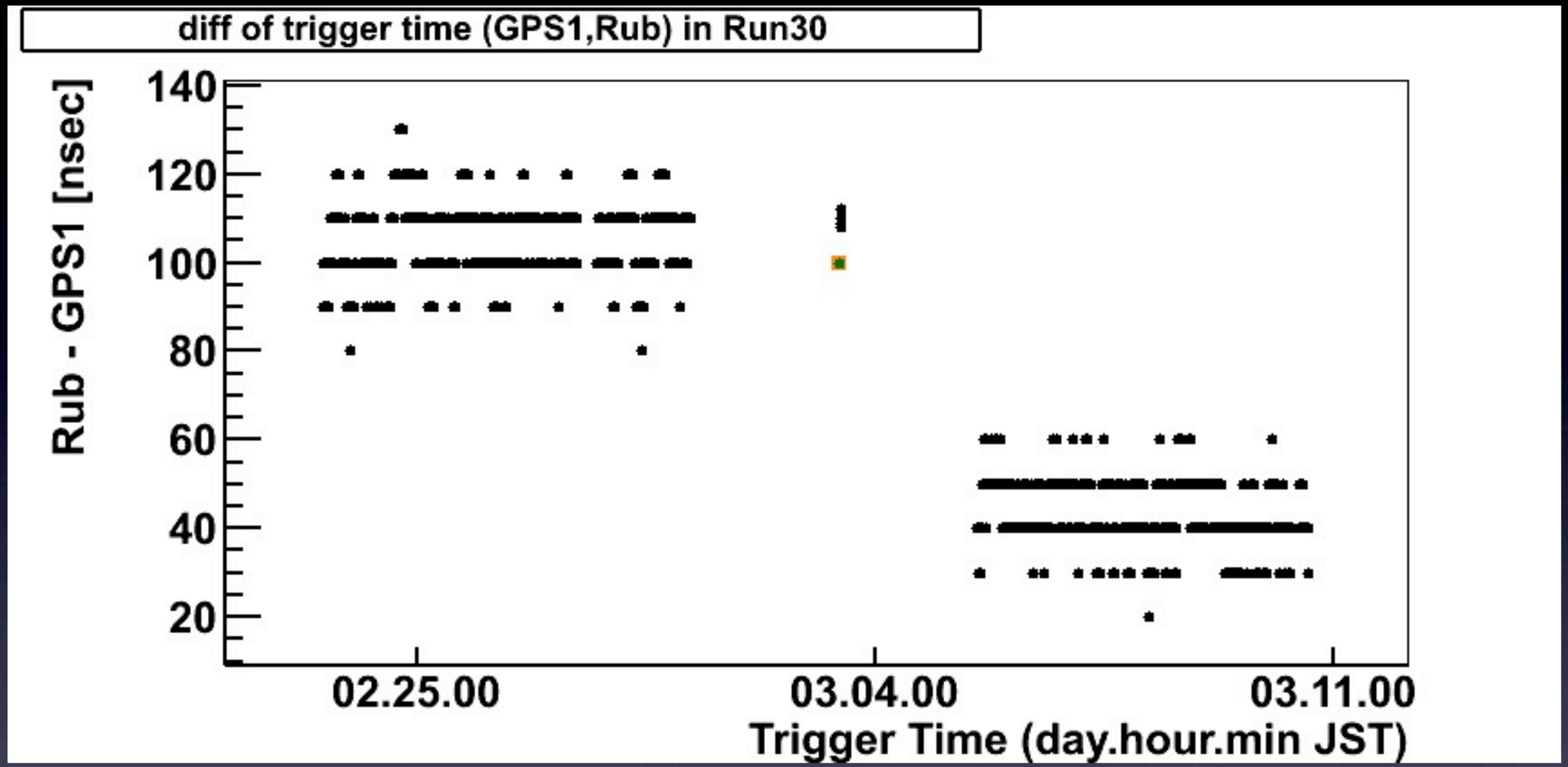


black point : all

orange point : GPS1 is not good status.

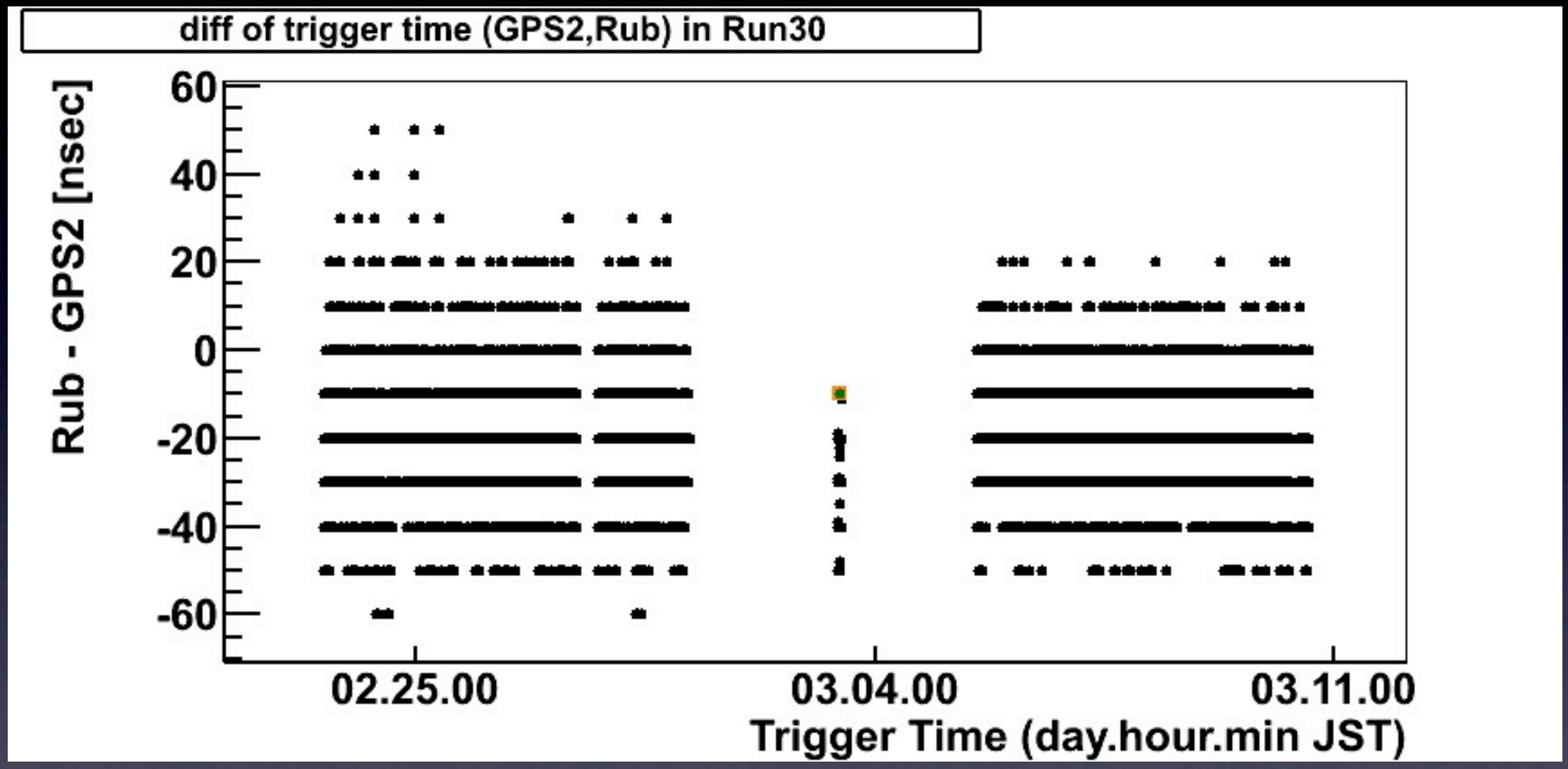
green point : GPS2 is not good status.

Run 30 (Rub-GPS1)



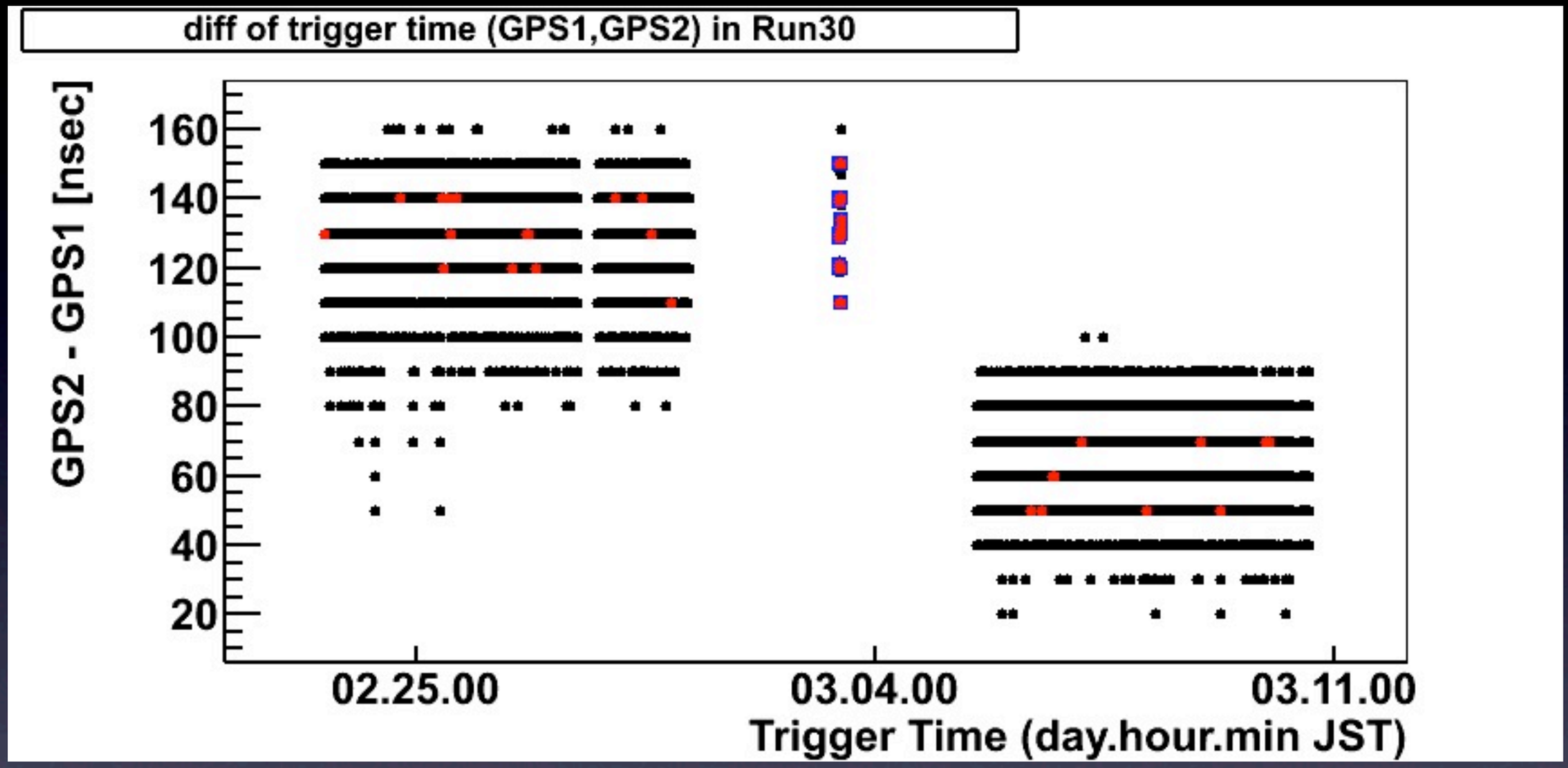
black point : all
orange point : GPS1 is not good status.
green point : GPS2 is not good status.

Run 30 (Rub-GPS2)



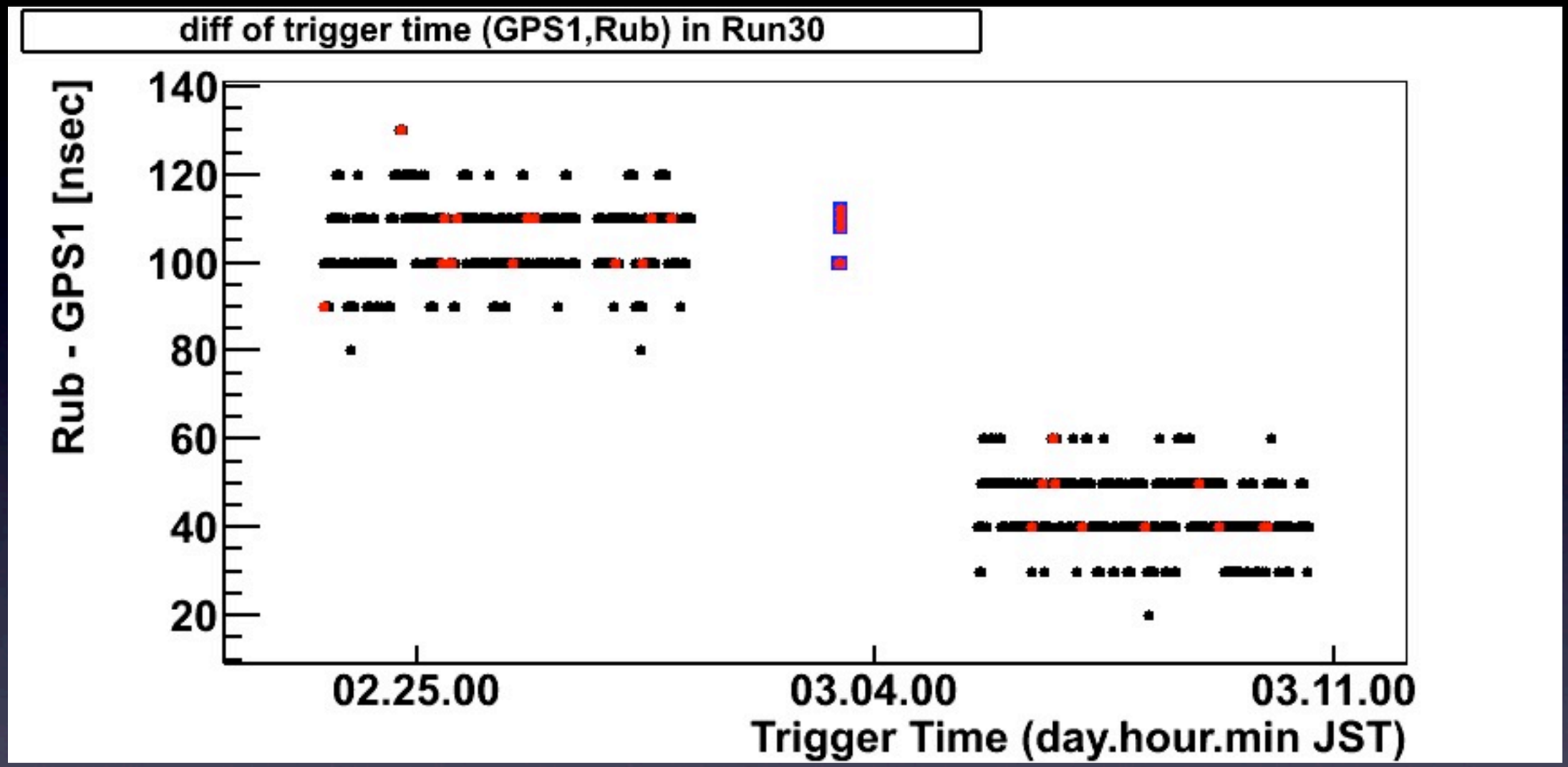
black point : all
orange point : GPS1 is not good status.
green point : GPS2 is not good status.

Run 30 (GPS2-GPS1)



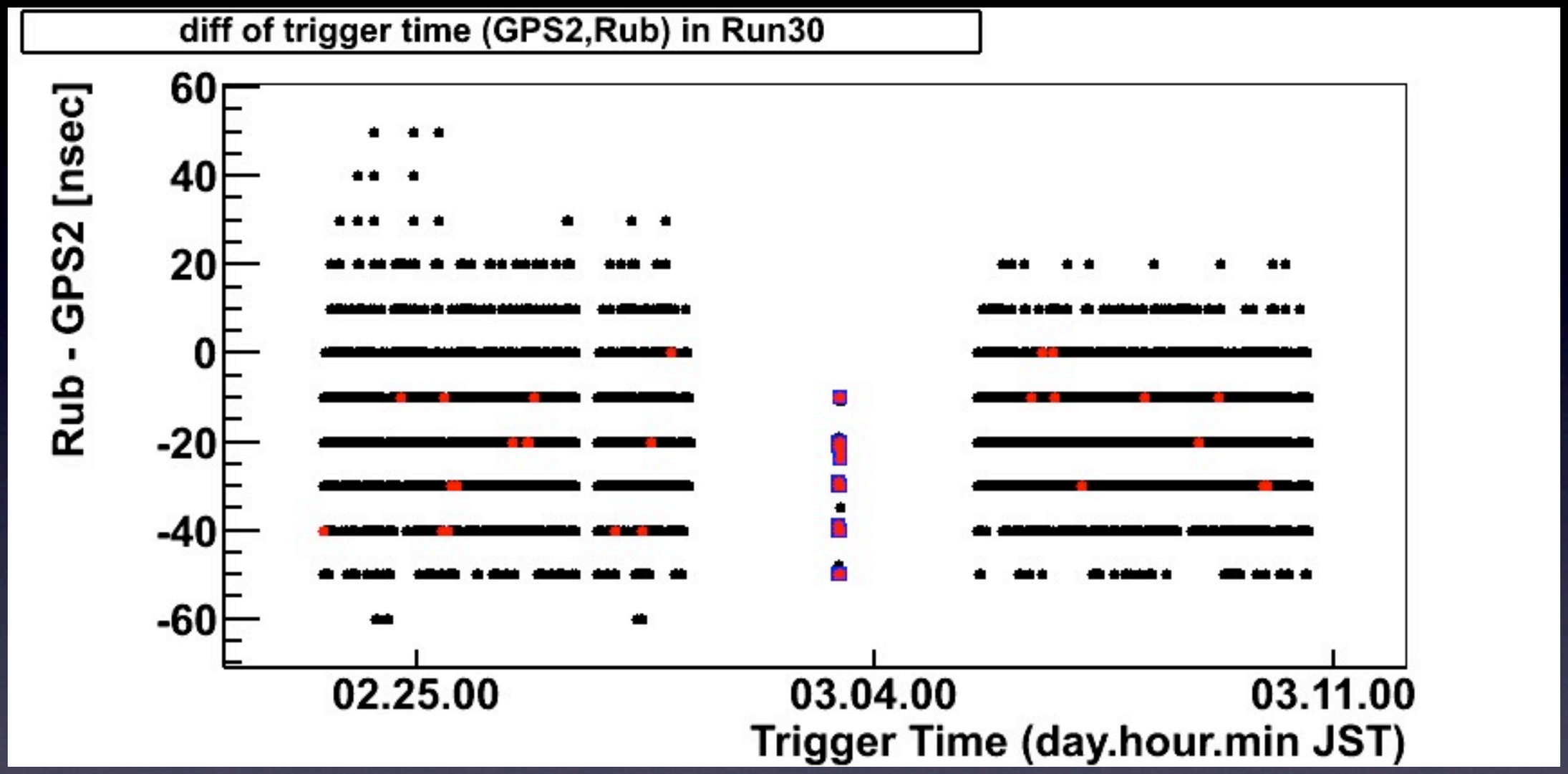
black point : all
blue point : GPS1 is not perfect.
red point : GPS2 is not perfect.

Run 30 (Rub-GPS1)



black point : all
blue point : GPS1 is not perfect.
red point : GPS2 is not perfect.

Run 30 (Rub-GPS2)



black point : all
blue point : GPS1 is not perfect.
red point : GPS2 is not perfect.

summary 2010jan

- Data set
  - nurun=300165からのデータ
- Some GPS error happened, but deltaT is very stable.
- Rub clock need time for being stable after restart.

2010 mar

measured warning GPS status

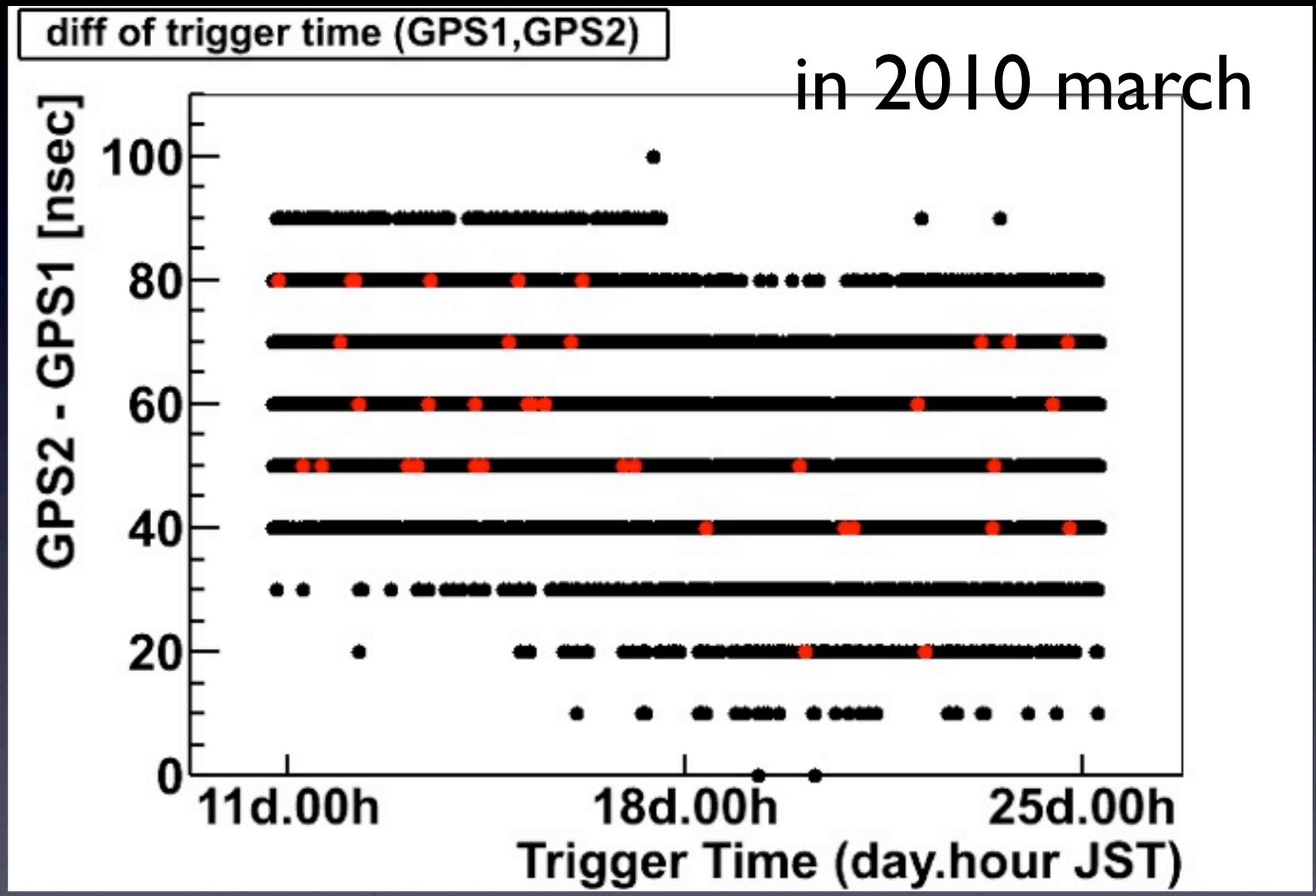
- 390 = 0x186 → “Perfect” + GPS_TIME_INC_BAD
- 430 = 0x1ae → “Perfect” + GPS_REQUIRE_CORRECT + GPS_CPU_TIME_DIFF_BAD + GPS_TIME_INC_BAD
- 426 = 0x1aa → “Perfect” + GPS_CPU_TIME_DIFF_BAD + GPS_TIME_INC_BAD

measured GPS waring status

total entry = 252237, total error = 28 (0.011%)
GPS1: All OK, GPS2:some warning (detail is below)

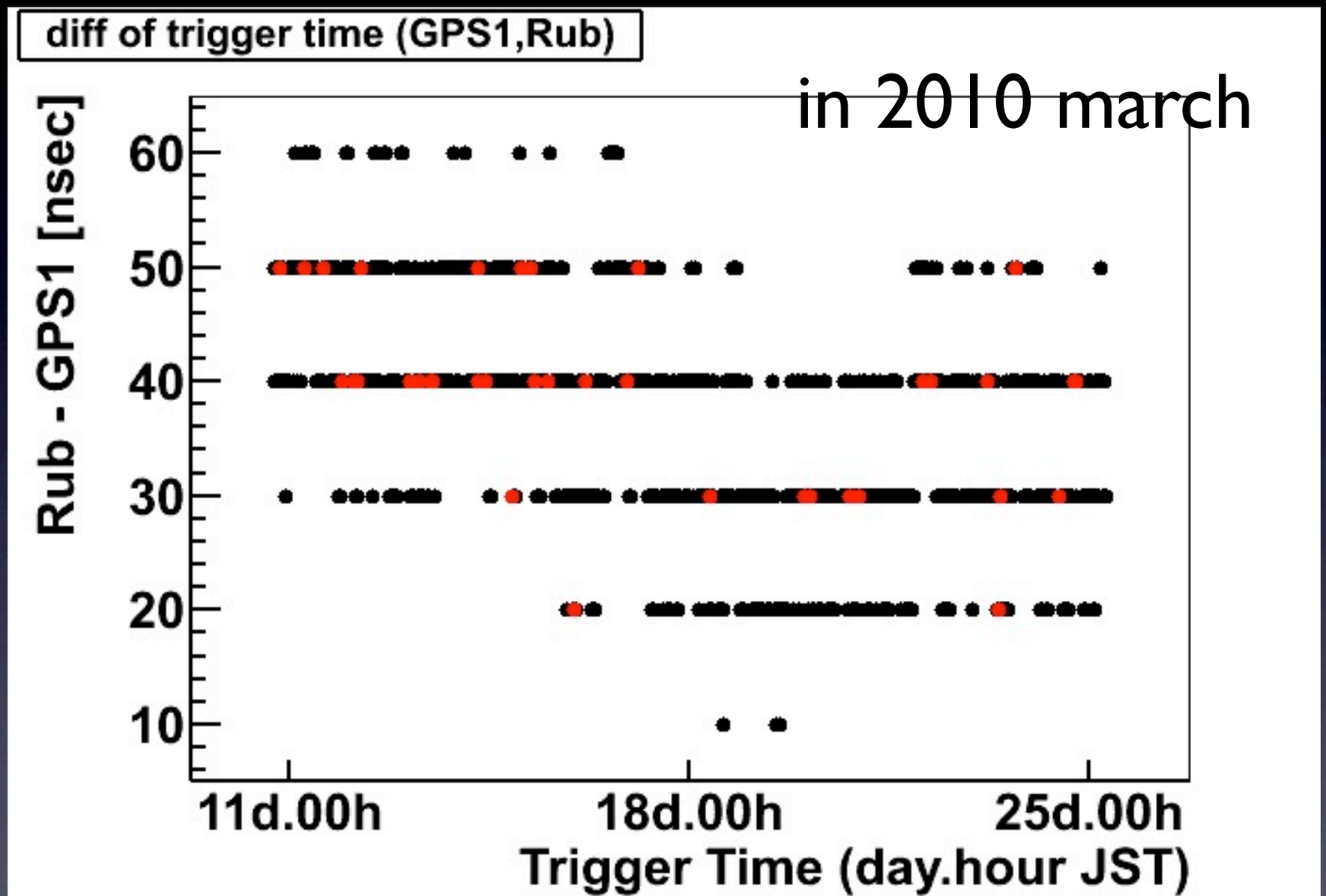
run #	# of entry	error code	# of error	%
300165	45151	390	5	0.0111
		430	2	0.0044
300169	125197	390	6	0.0048
		430	10	0.008
310001	10863	390	1	0.0092
310026	1829	430	1	0.0547
310030	10113	390	1	0.0099
310033	12315	430	2	0.0162

difference of trigger time (GPS1, GPS2)



black point : all gps status
red point : GPS2 warning status

difference of trigger time (GPS1, Rub)

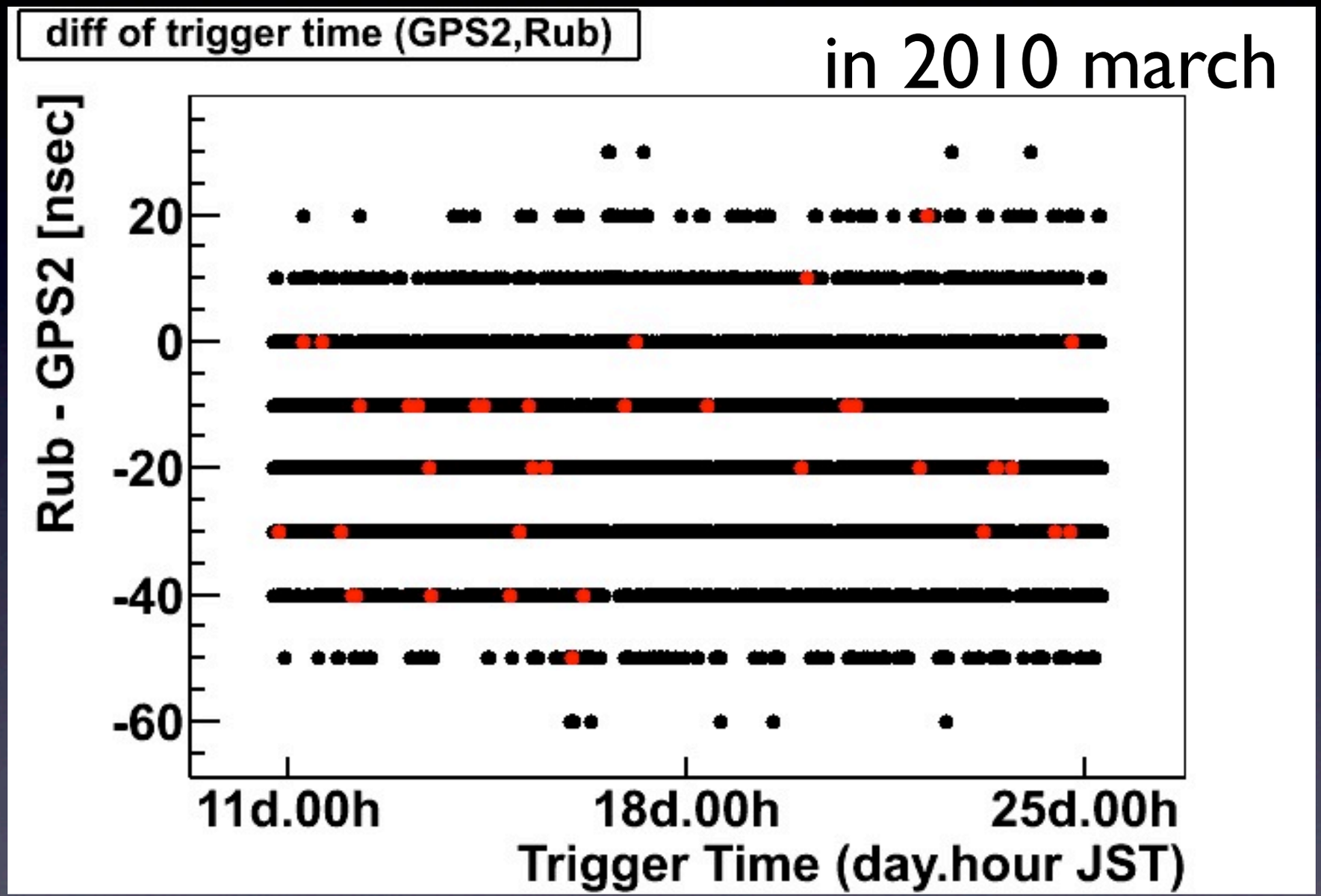


in 2010 march

black point : all gps status

red point : GPS2 warning status

difference of trigger time (GPS2, Rub)



black point : all gps status
red point : GPS2 warning status

- in 2010 march, GPS module stable
- GPS status and deltaT

todo

- Study GPS error condition.
  - When GPS error message occur ?
  - Which error is critical ?