



Earthquake and DR alignment

ATF survey 2012

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15th ATF2 Project Meeting

23~25th January 2013 at KEK (Shokuin-Kaikan 2F)



2012

contents

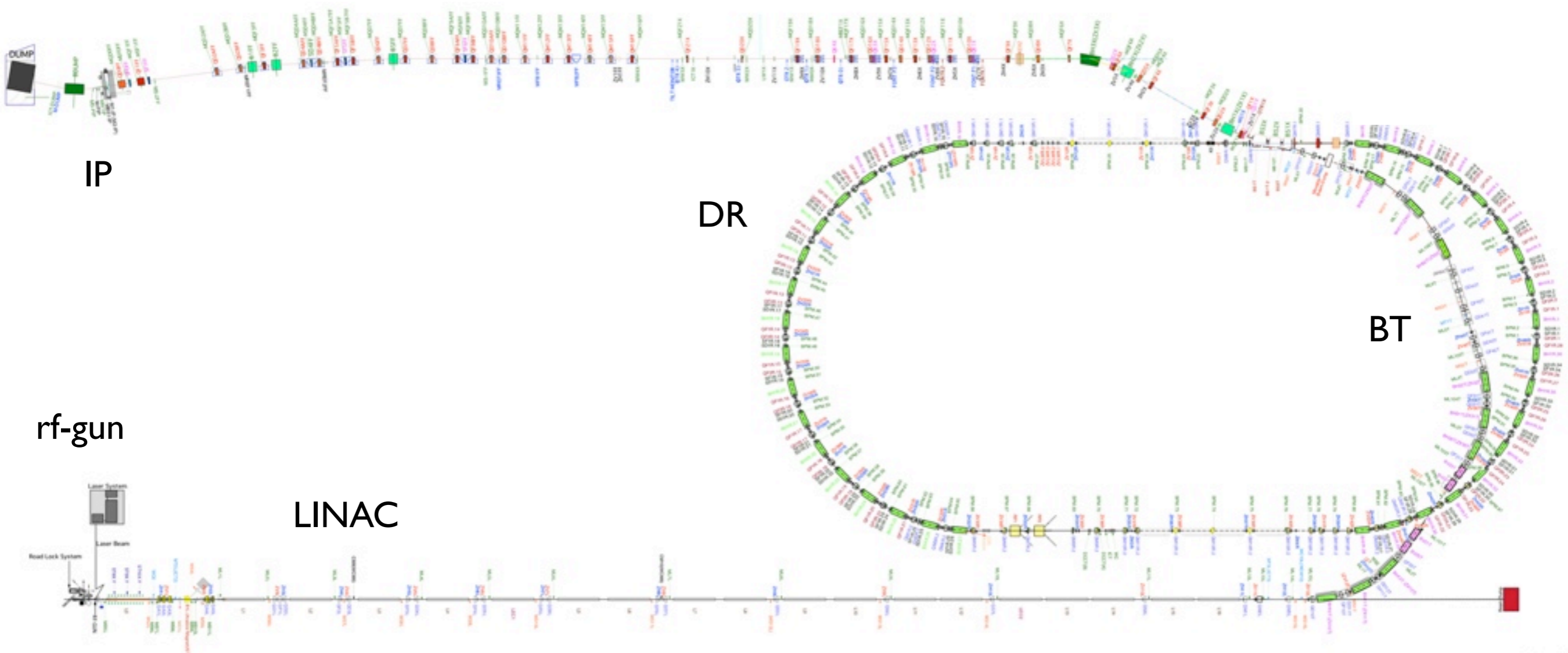
- Survey for DR and Septum (January)
- Alignment for BT [new design 2012] (February)
- Survey for DR and EXT/FF (April, May)
- Survey for DR and ATF2 (Sep. Oct)
- Beam operation
- earthquake (7 Dec.)
- Recover, Survey and Alignment

- Linac (not yet surveyed this year)
- BT (not yet alignment)
- **DR** (a result of a survey)
- Alignment (earthquake 7th Dec.)
- **EXT/FF** (also a result of a survey)
- Changed to QFI



ATF

EXT/FF (ATF2)



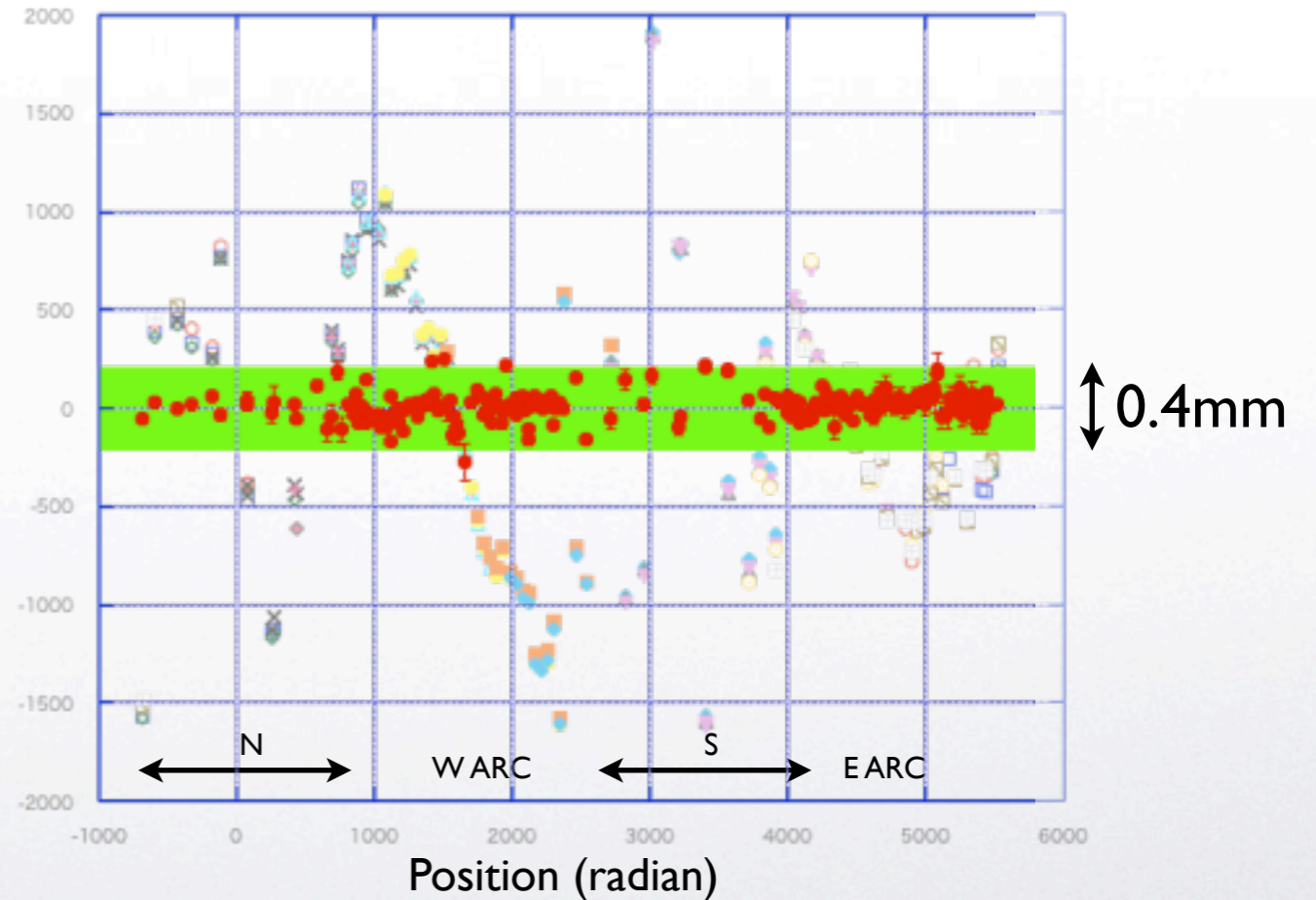
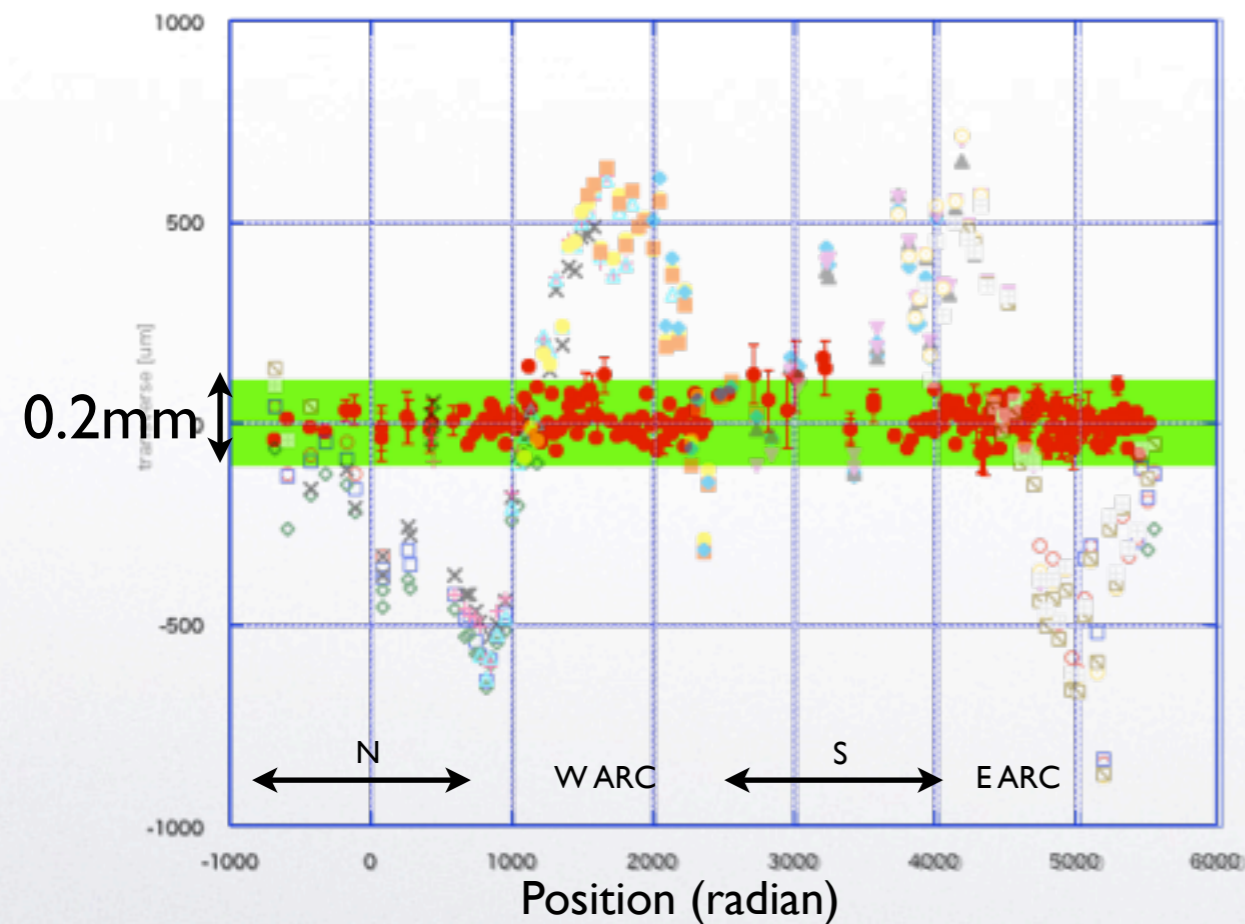


DR survey

- after alignment (september)
This picture is already shown last time.

Perpendicular to the beam (動径方向)

Along the beam (ビーム方向)



• Transverse +/- 0.15mm

• Longitudinal +/- 0.27mm

RMS: 0.05mm

RMS: 0.08mm

- performing DR alignment last year.



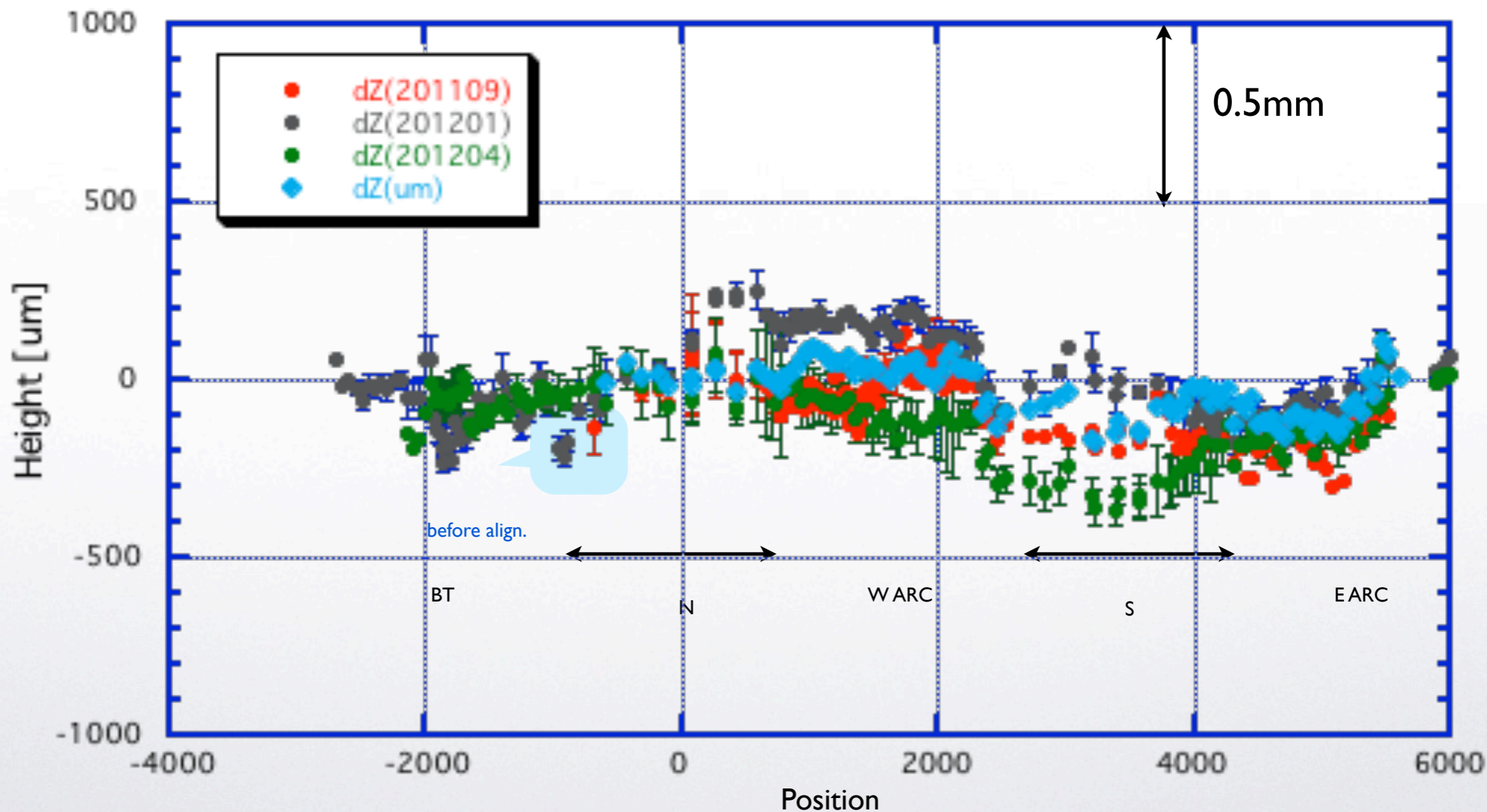
DR survey



- Vertical (Height)

- Sep. '12

survey of DR-all Height



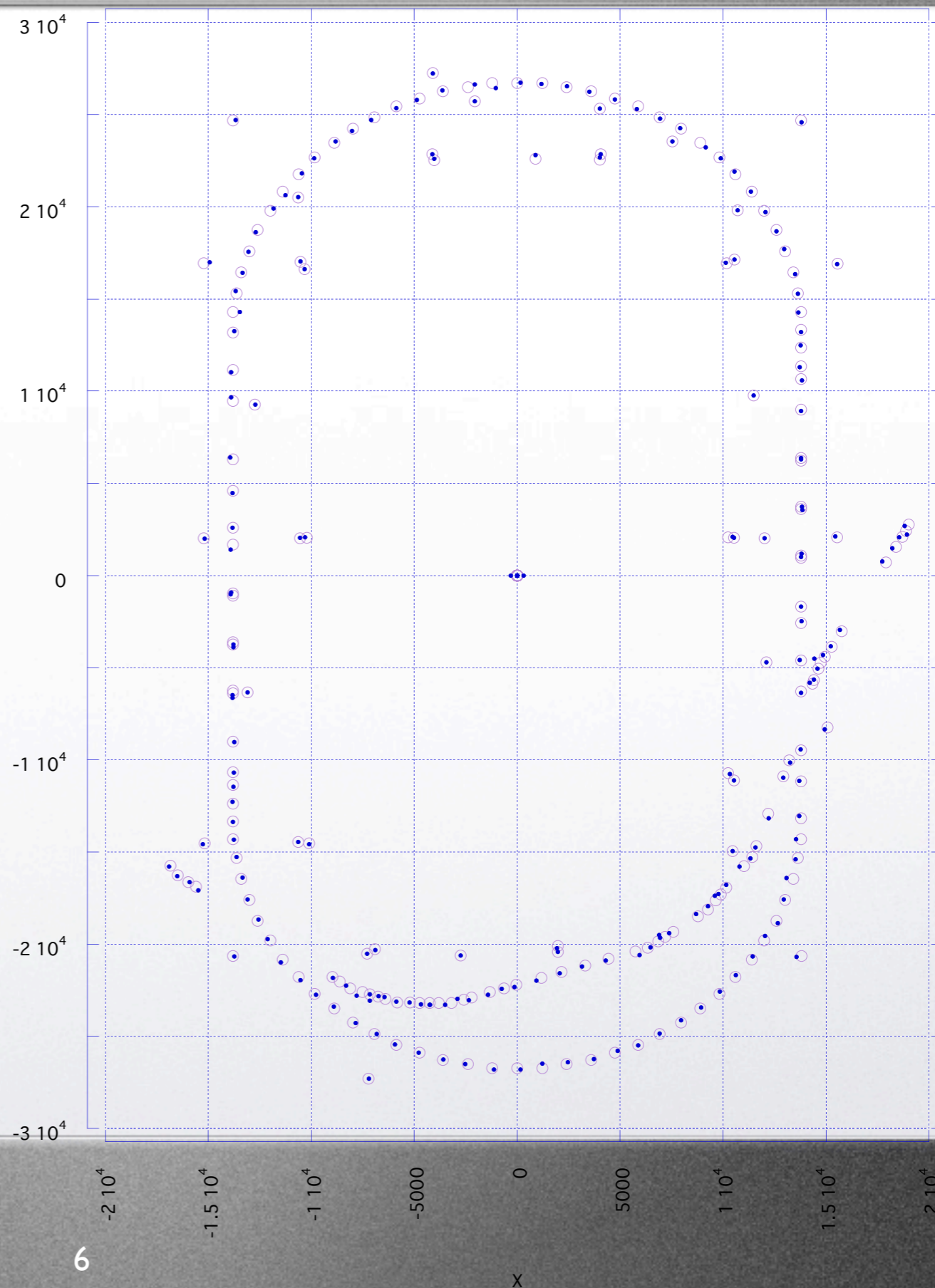


DR



[measurement - design] Δ difference x1000

- DR reference POS. is area of SEPTUM
- Blue dot : Sep. 2012





つくば市 震度4

発生時刻

2012年12月7日 17時18分頃

震源地

三陸沖

(牡鹿半島の東240km付近)

最大震度

震度5弱

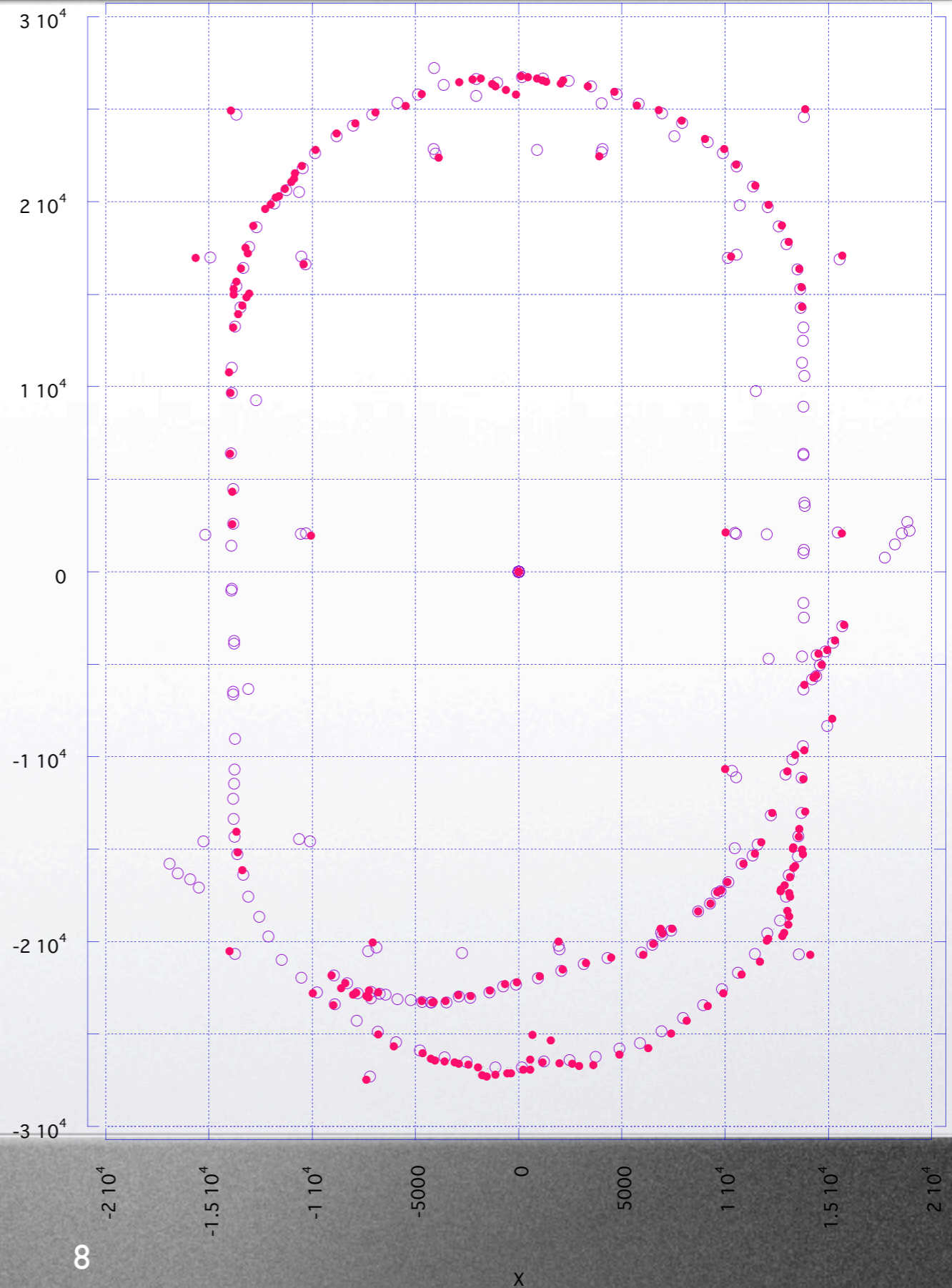


県内震度3以上であり、揺れが長くて、3.11の地震に近いものを感じた。



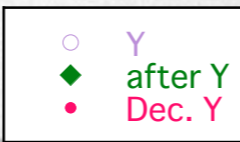
[measurement - design] Δ difference x1000

- DR reference POS. is area of SEPTUM
- Blue dot : Sep. 2012
- Red dots : 10th Dec 2012 (earthquake)





DR

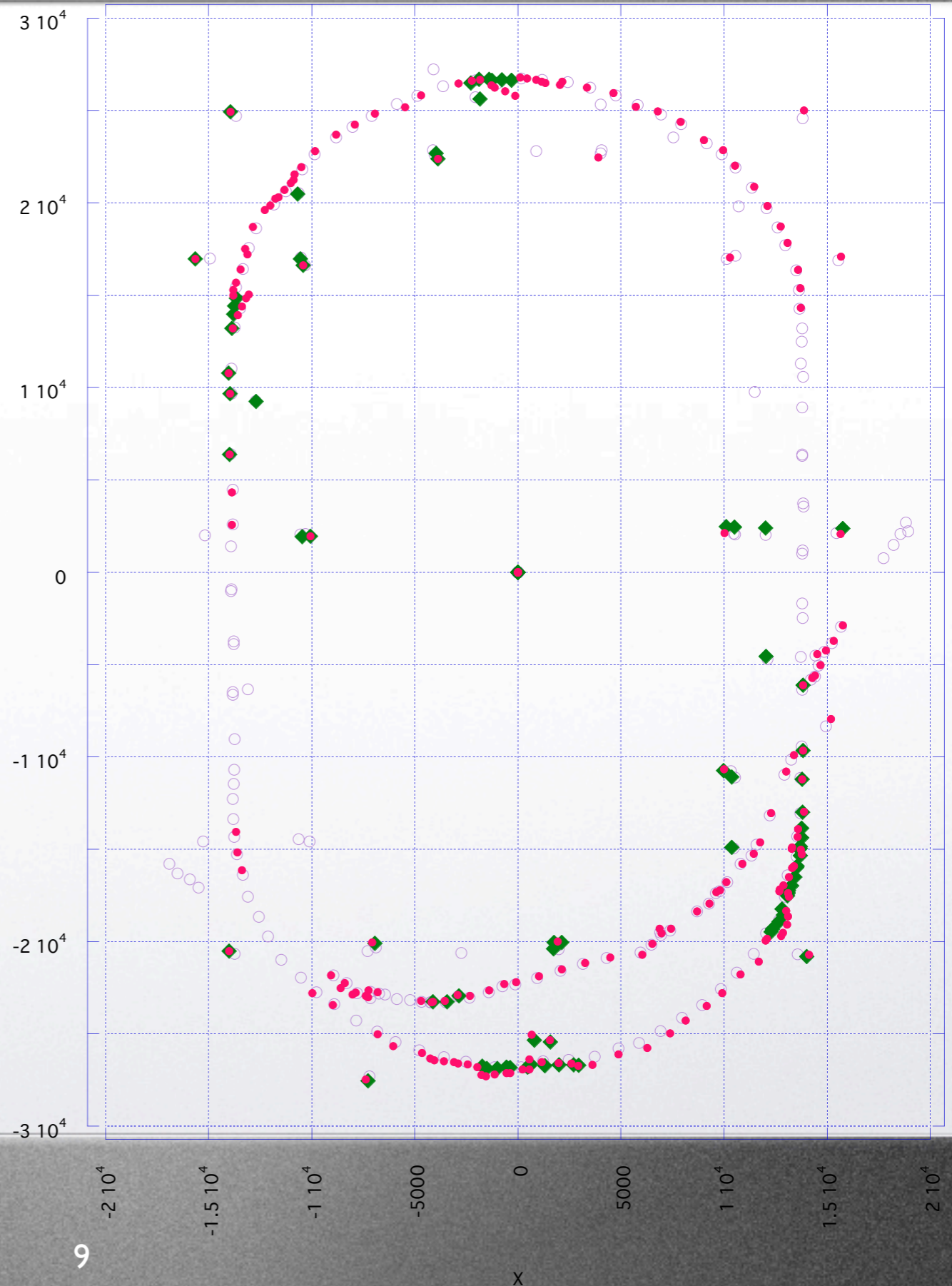


hDASI_heikin XY Plots DEC. 2012
Green: After alignment Movers



[measurement - design] Δ difference x1000

- DR reference POS. is area of SEPTUM
- Blue dot : Sep. 2012
- Red dots : 10th Dec 2012 (earthquake)
- Green dots : after alignment





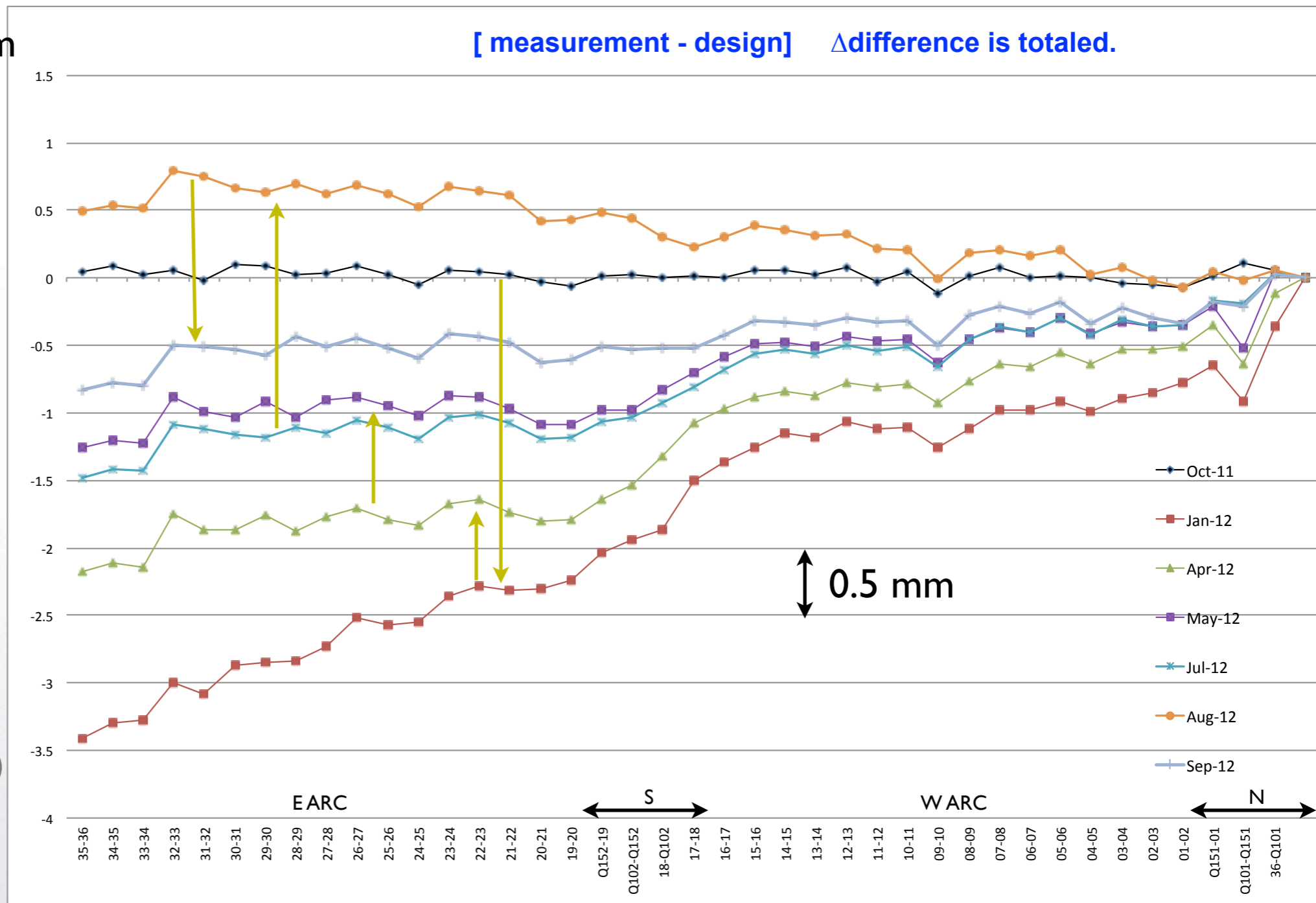
DR survey ~2012/09



● circumference

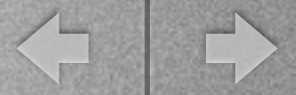
(Bend to B distance) sum

- +0.1mm Oct '11
- -3.4mm Jan '12
- -2.2mm Apr '12
- -1.3mm May '12
- -1.5mm Jul '12
- +0.5mm Aug '12
- -0.8mm Sep '12
- diff. Hex sum
(+1.2mm 10th Dec)
(-1.5mm 28th Dec)





DR servey 28th Dec

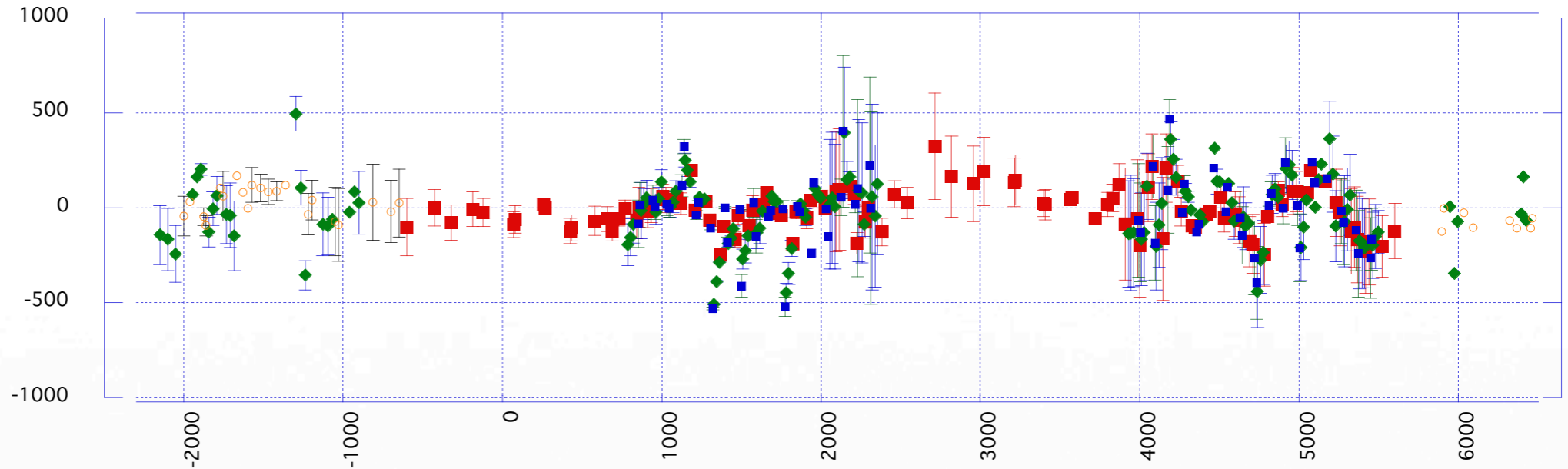


2012 December 24-26 Measurment for DR
meas. - SAD design [um]



Transverse

DR-sad6fit-h2

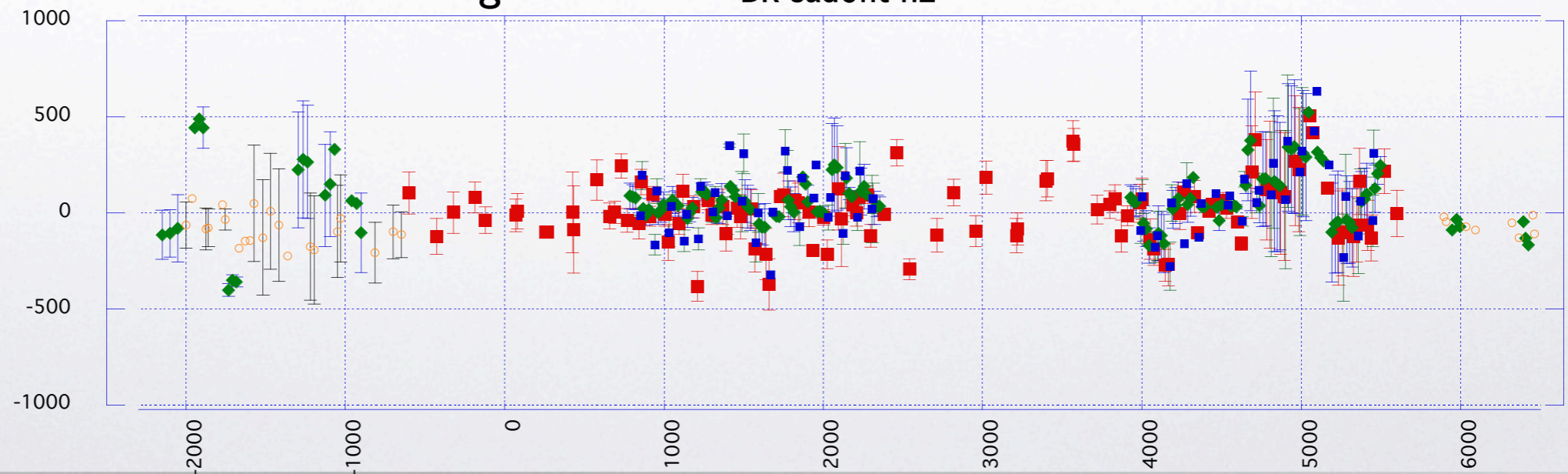


- It cannot be said that it is very good.



Longitudinal

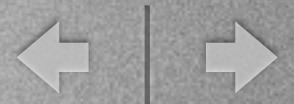
DR-sad6fit-h2



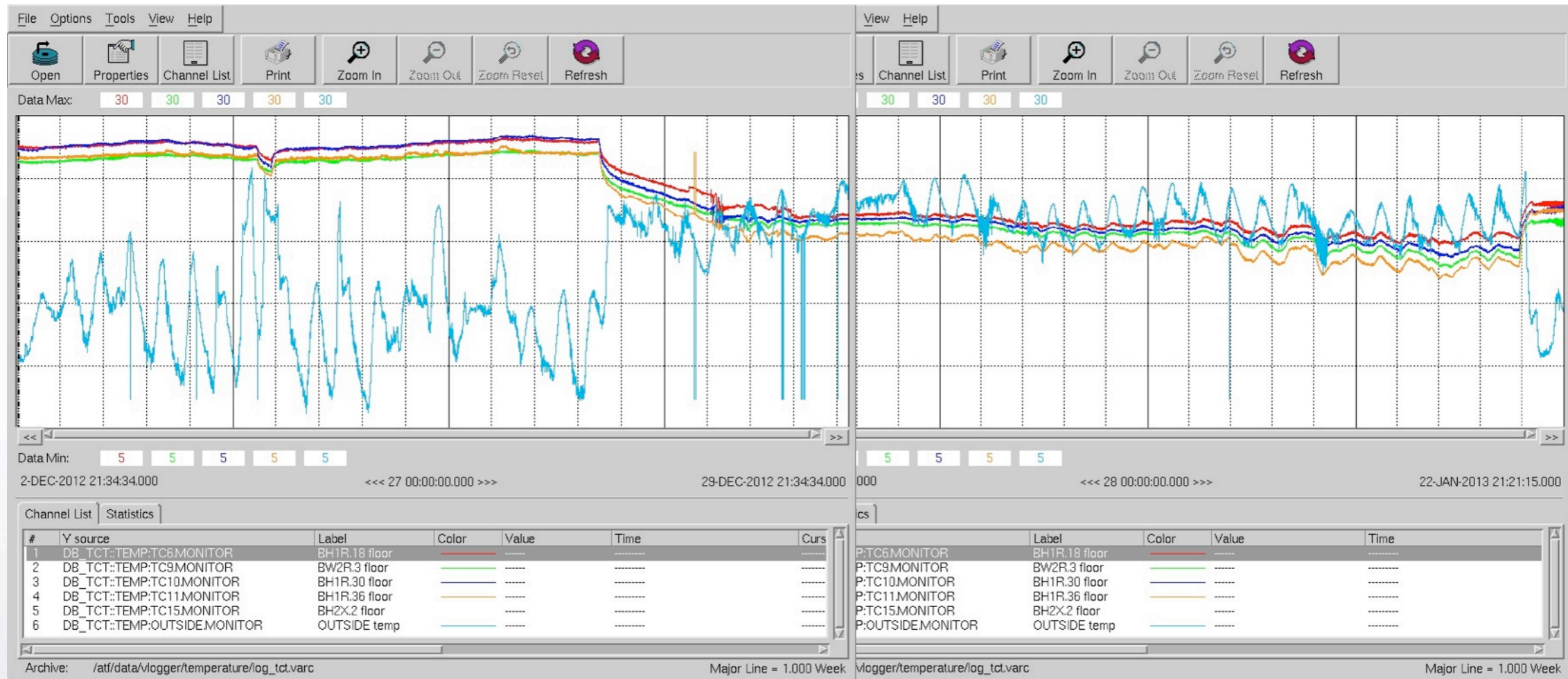




Temperature

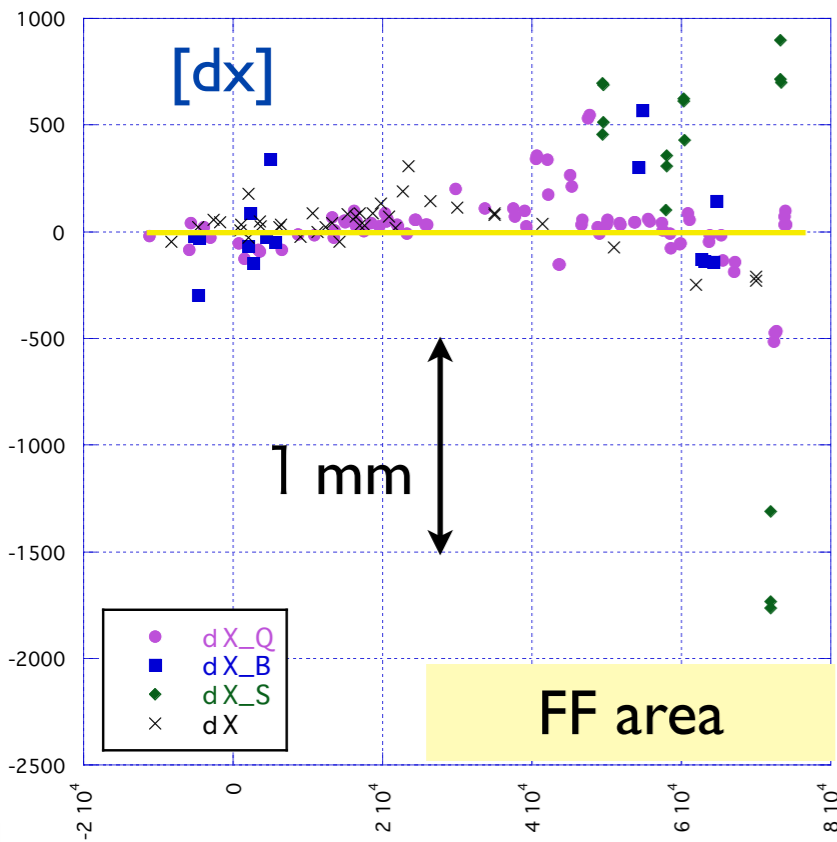
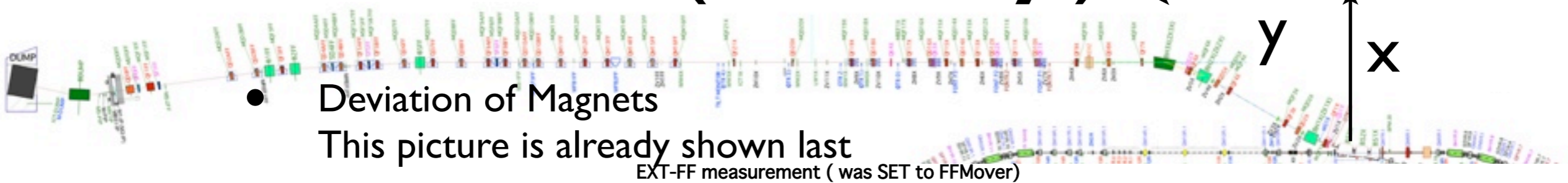


- Temperature of the floor of DR

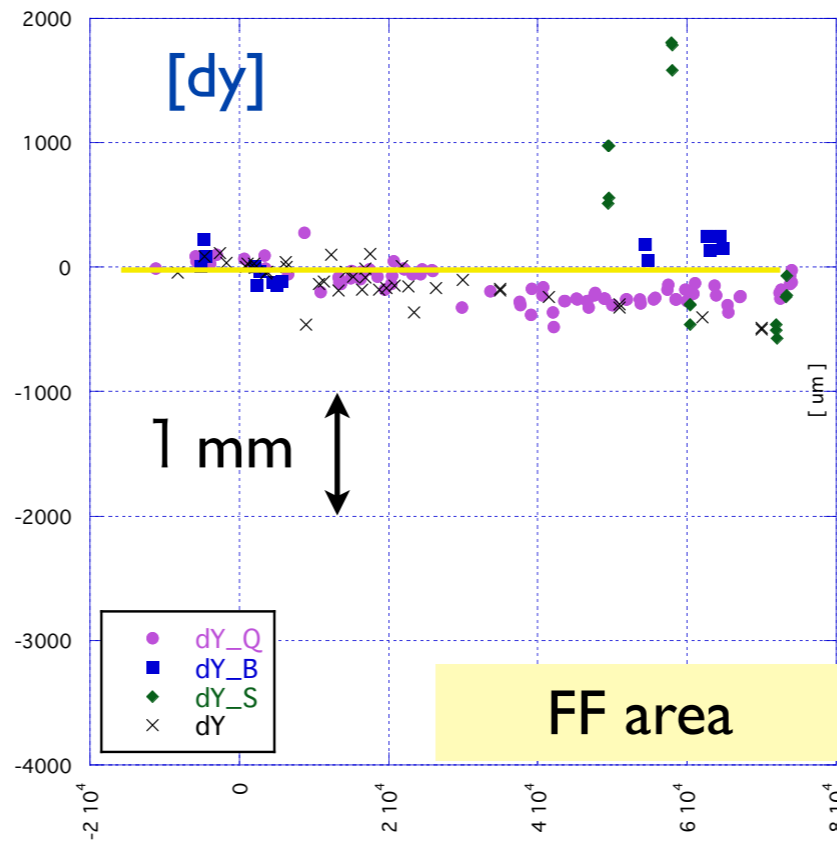




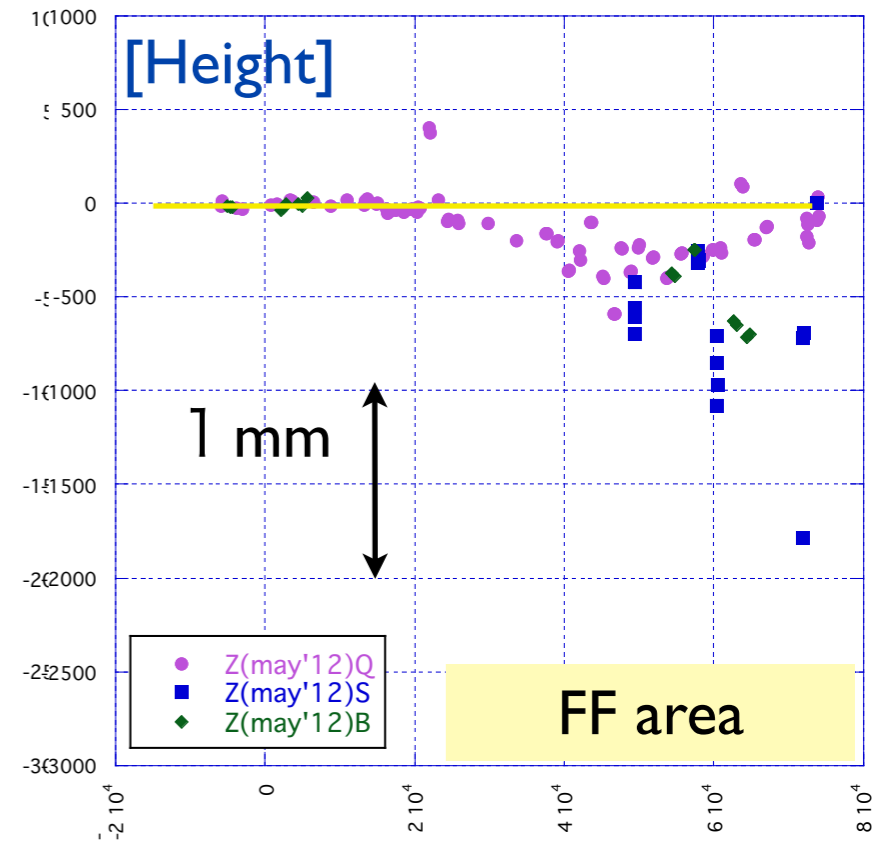
EXT/FF(survey) May '12



(\approx Transverse) Qmag_RMS: 0.169mm



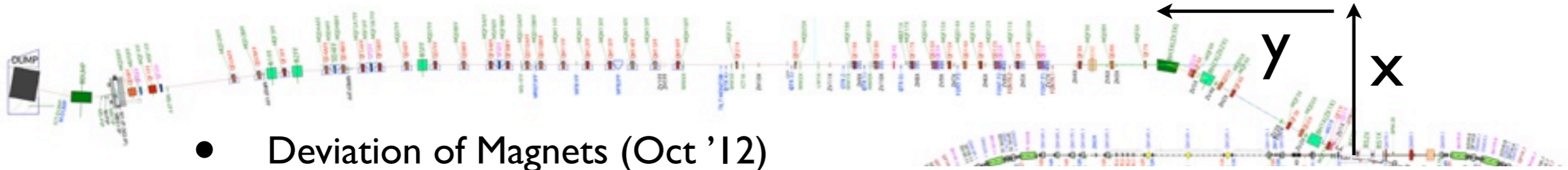
(\approx Longitudinal) Qmag_RMS: 0.205mm



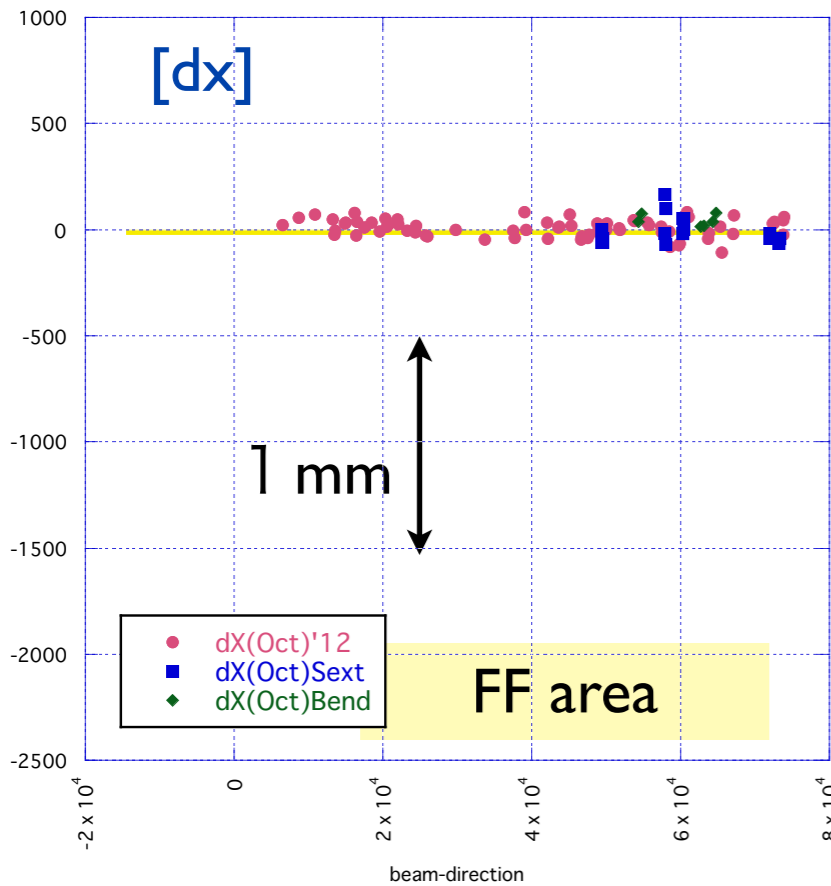
(Height) Qmag_RMS: 0.218mm



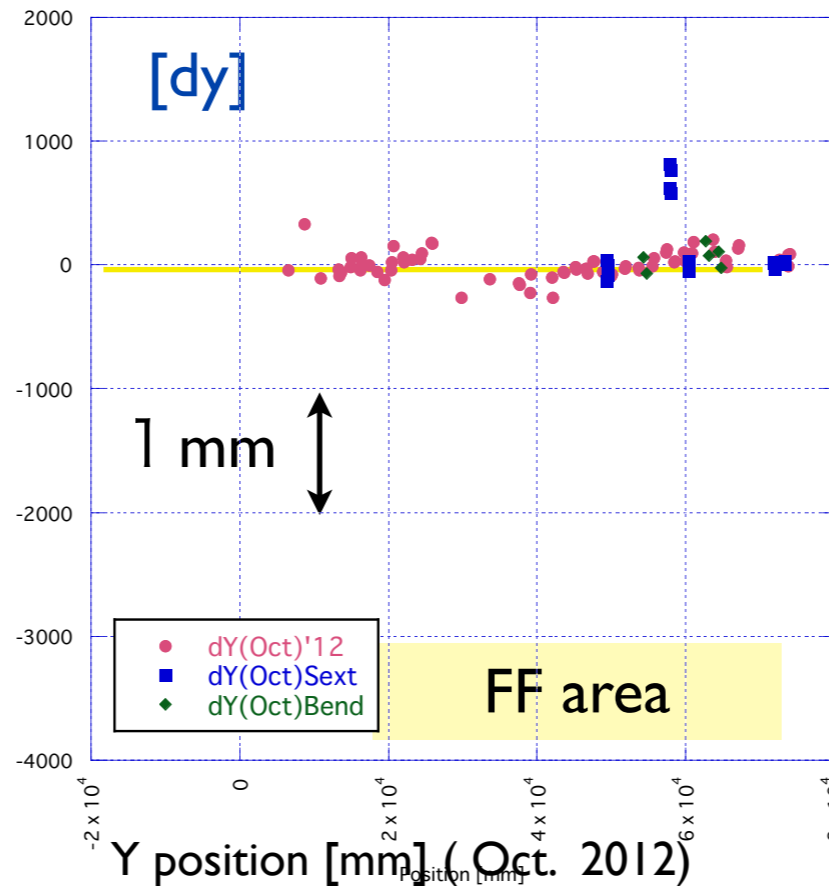
EXT/FF() Oct '12



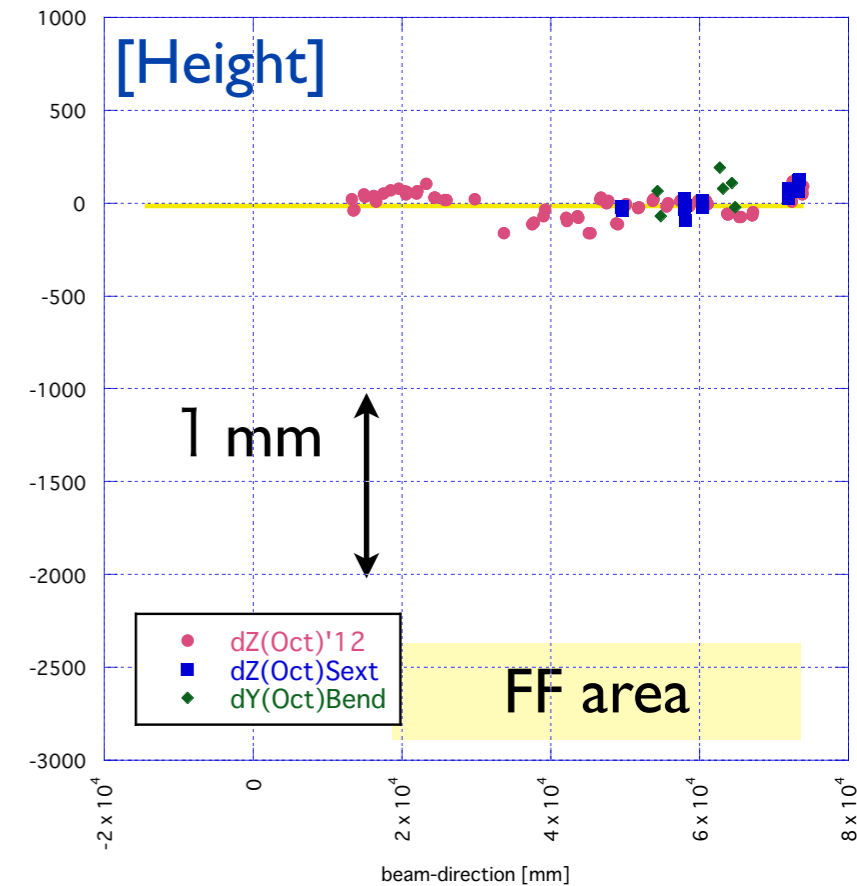
- Deviation of Magnets (Oct '12)



(\approx Transverse) Q_{mag_RMS} : 0.041mm



(\approx Longitudinal) Q_{mag_RMS} : 0.105mm



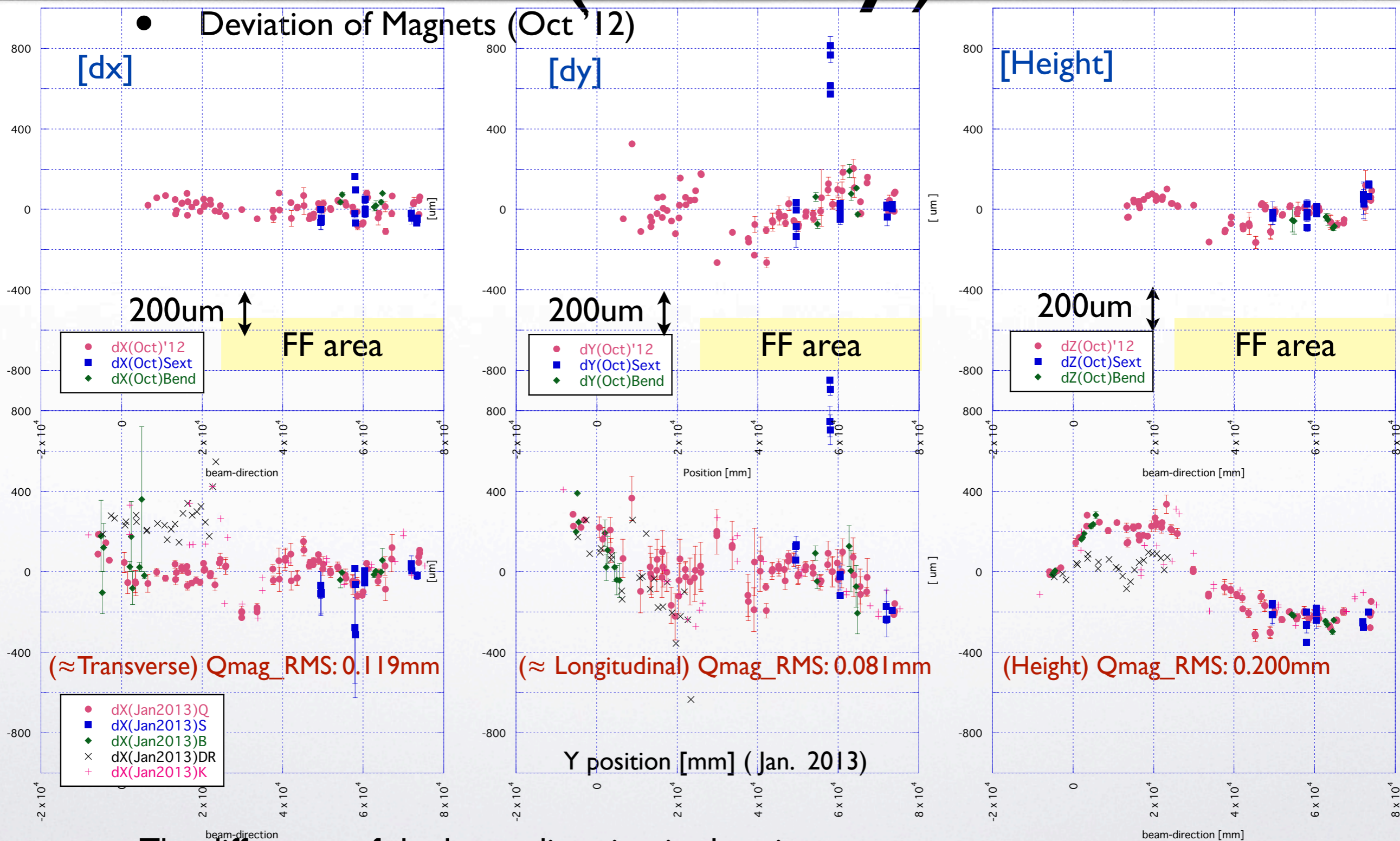
(Height) Q_{mag_RMS} : 0.064mm

- Alignments for SD4, SF5, SD6, SFI, SD0, QFI, QD0
- Nov. 11th~ replaced for QFI
-



EXT/FF(survey)

zoom



- The difference of the beam direction is changing.

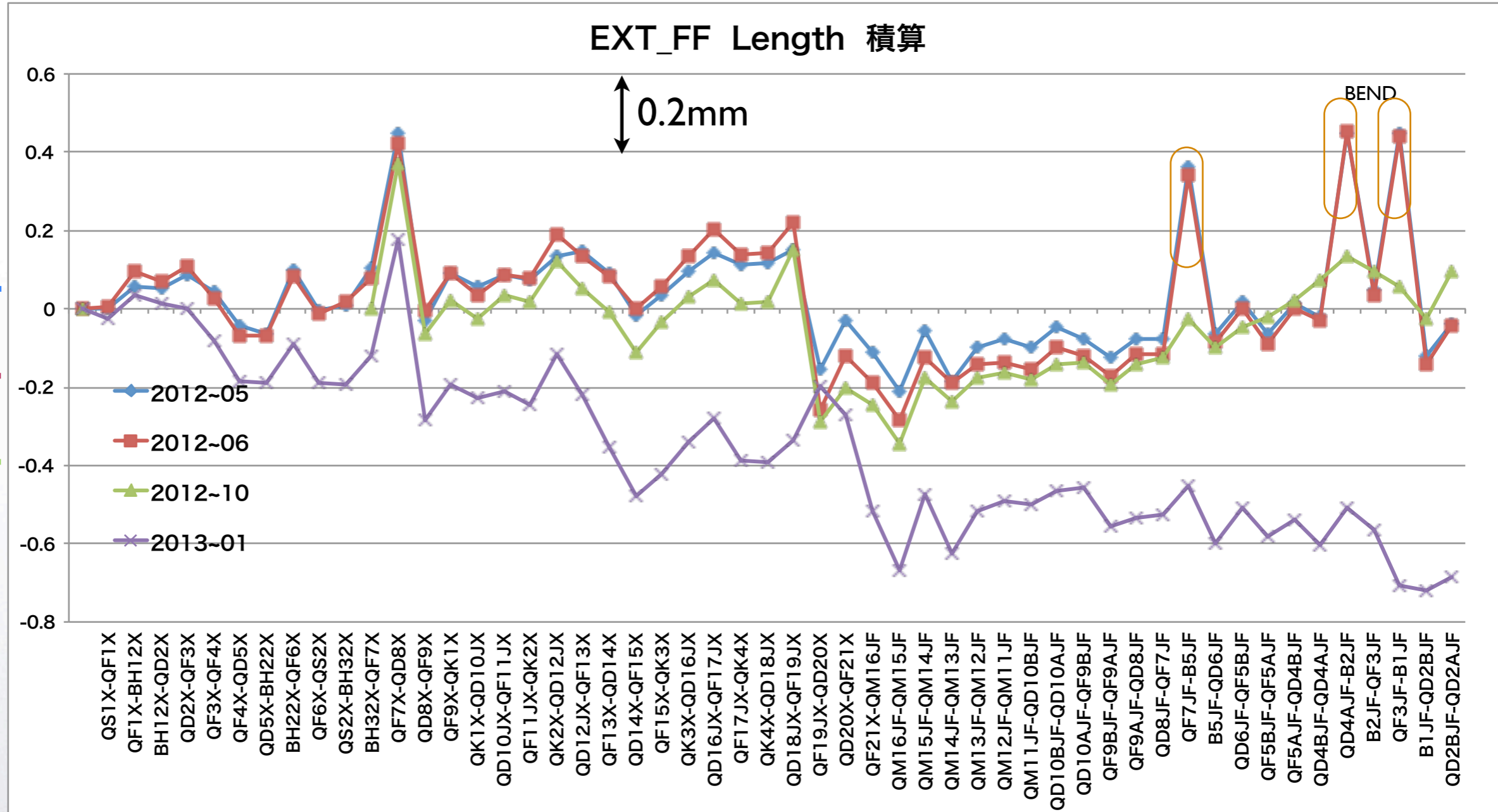
- I think that length became short.



EXT/FF (QS1X ~ QD2A)



May. '12
 Jun. '12
 Dec. '12
 Jan. '13



What is different?

It has shrunk. ~0.7mm



summary

- DR & ATF2 has a seasonal variation.
- DR was restored for 24 hours after change by an earthquake.
- The survey in the state where the electromagnet has got cold differs from the running of operation.
- Moreover, correlation with temperature is investigated.
 - It seems that length changes also in ATF2



おわり

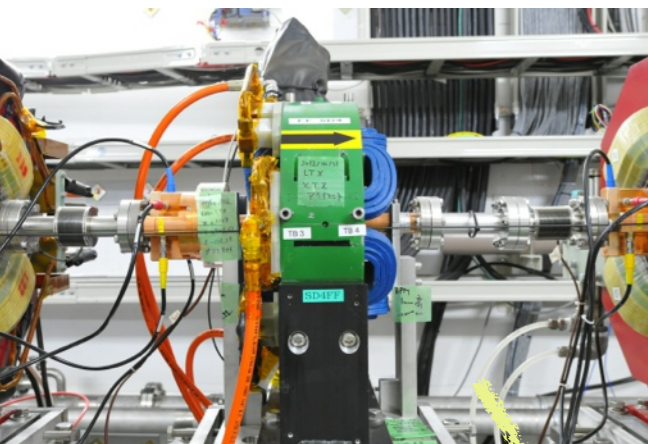


- Thanks for your attention!



exchanging SD4 & SF5

SD4 in '12

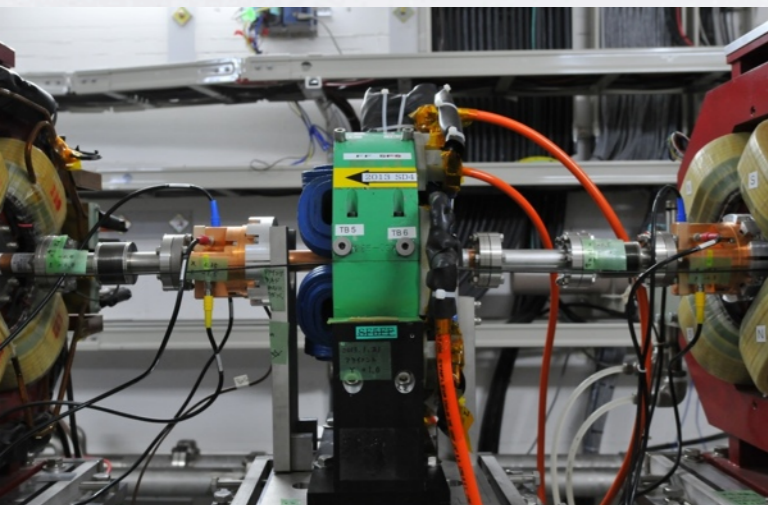
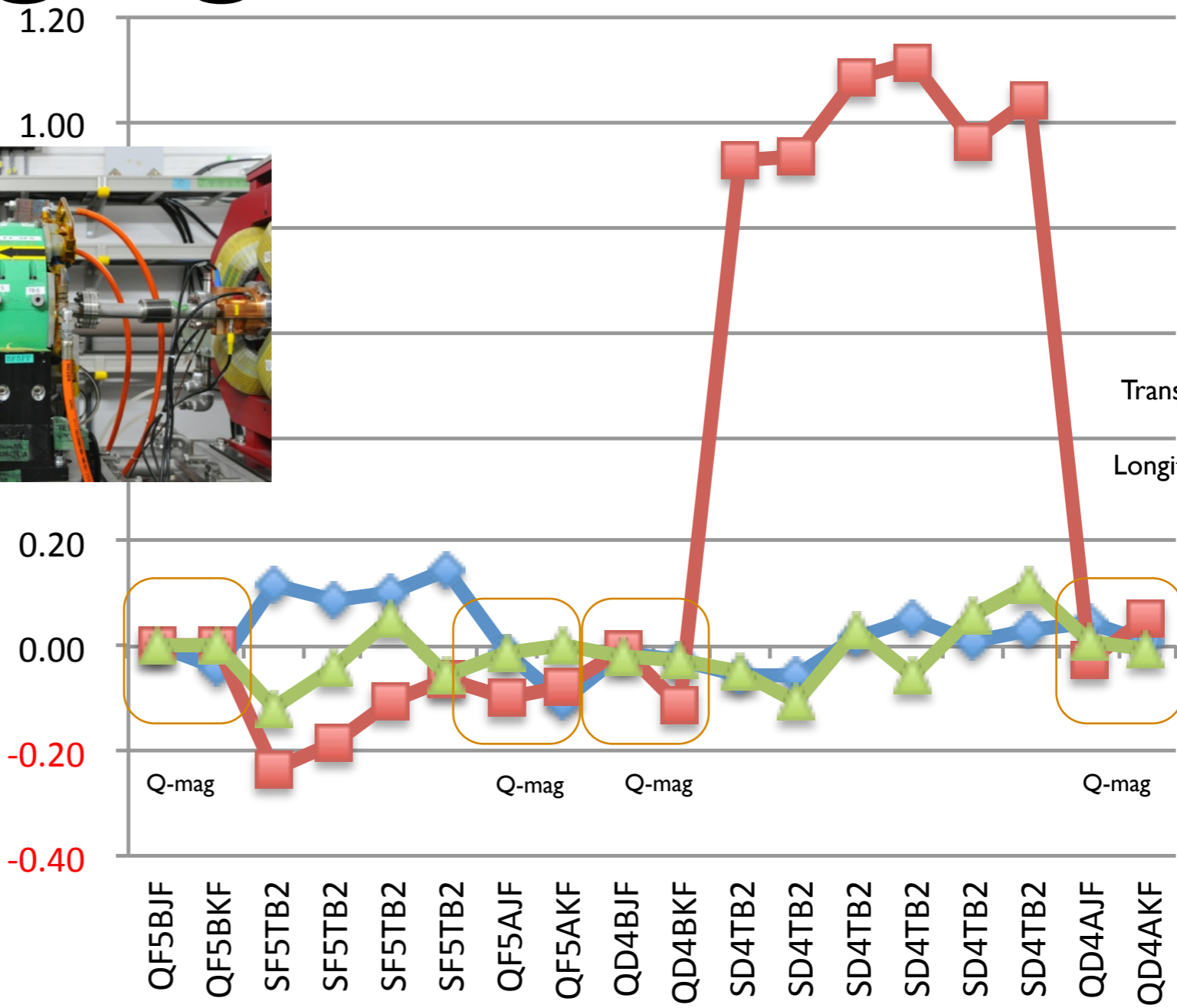


SF5 in '12



The alignment result after exchange on 21st Jan. '2013.

Longitudinal (Y) position of new SD4 (SF5 in 2012) was changed 1 mm.





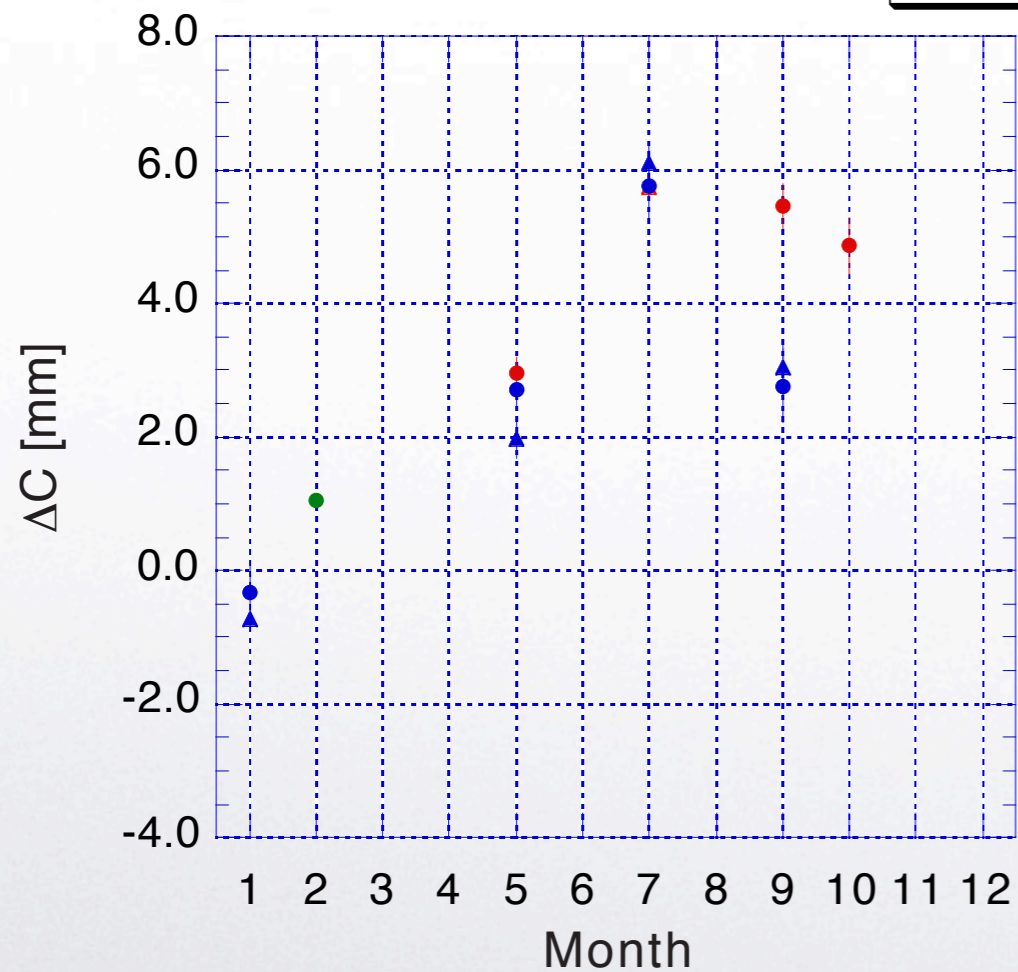
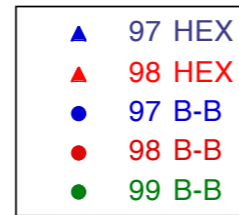
● Circumference

コンクリート膨張率
 $0.58 \sim 1.5 \times 10^{-5} \cdot ^\circ\text{C}$

$(dL = 6\text{mm}) / 120\text{m}$
 $= \text{mm} / 20 \times 1000$
 $= 1/20000$
 $= 5 \times 10^{-5}$

$D \times \pi = 120\text{m} + 6\text{mm}$
 $dD = 0.006 / \pi$
 $= 19.1 \times 10^{-5}$

DR Circumference



一直線であれば、
 $3 \sim 5 \text{ } ^\circ\text{C}$
 の変化相当
 真円であれば、
 $13 \sim 21 \text{ } ^\circ\text{C}$
 の変化相当

MITO Temperature

