

# POLARITY TESTS, SECTORS 23/78

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ACK: OPERATIONS TEAM

Some news, on-going analysis and plans

Nov 3, 2009

# MOTIVATION

**Wrong polarity:** for example QT11.78 is OK now

**Inconclusive** results from 2008

**Beta beating** indicated a swap B1  $\rightarrow$  B2

**Hardware** measurements have indicated a problem

Possible misalignments from 2008 measurements (QT11.78)

Beam 1:

QT{**11**, 12, 13}.R2, Q4.R2, Q6.R2, Q6.L3, **MQS**

SF{1,2}, SD{1,2}, MCS, MSS

KOF, **KOD**

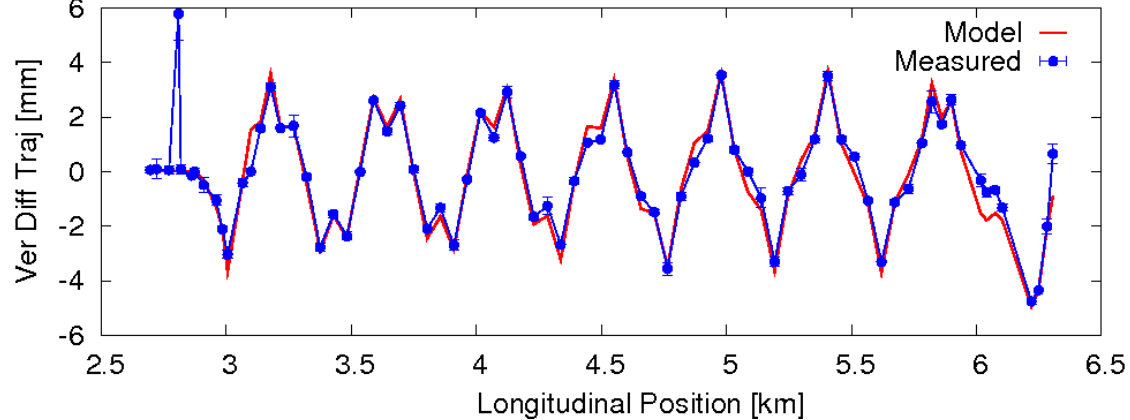
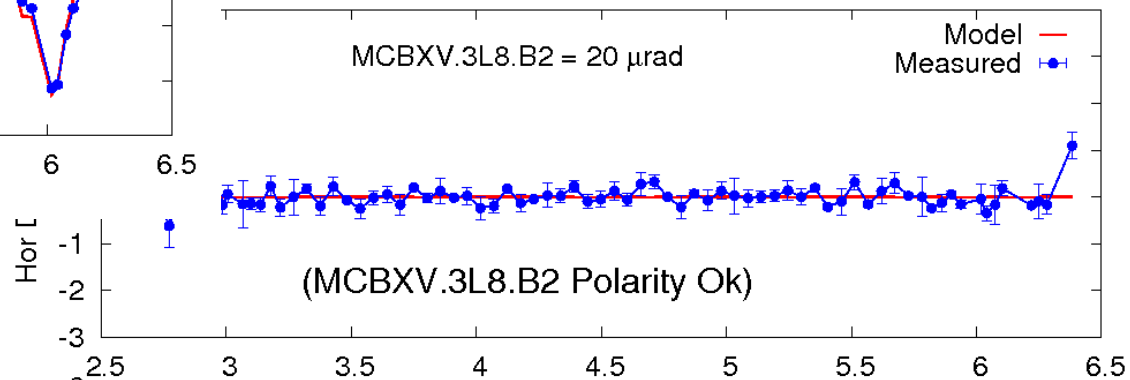
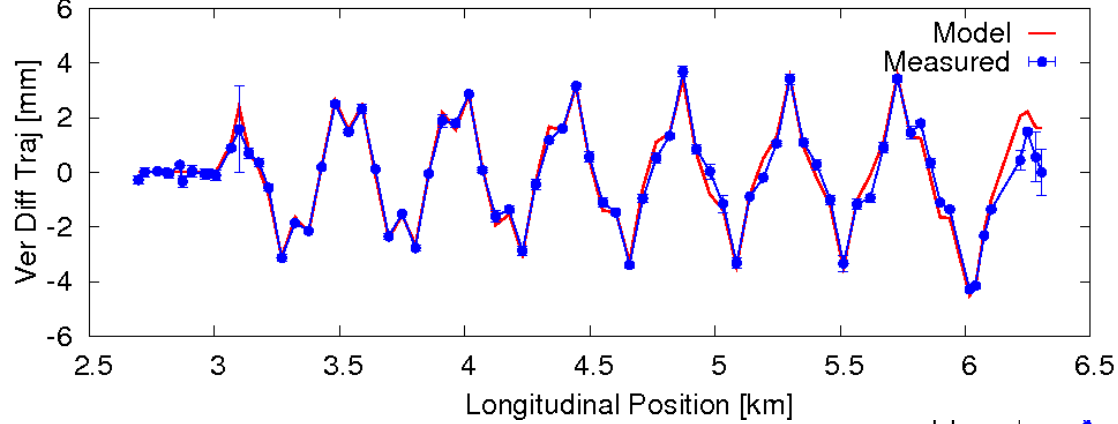
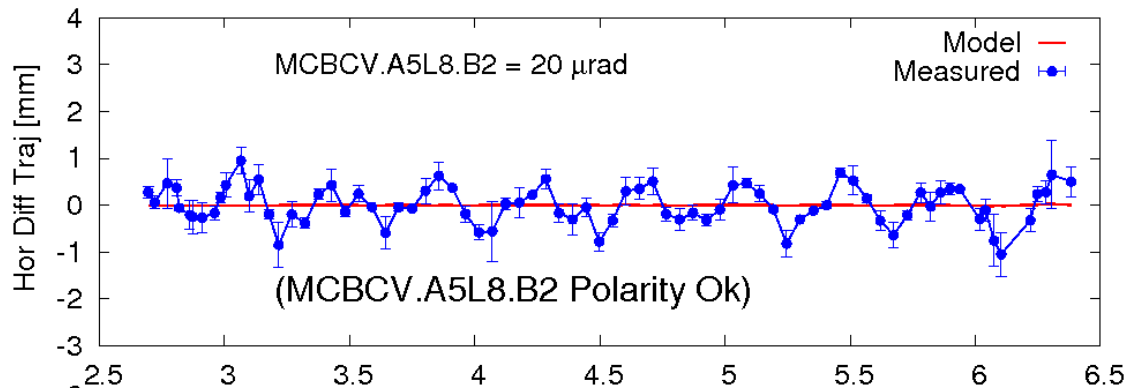
Beam 2:

QT{11( $\delta x_{\text{initial}}$ ), 12, 13 (noisy)}.L8, Q4.R7, Q5.R7, **MQS**

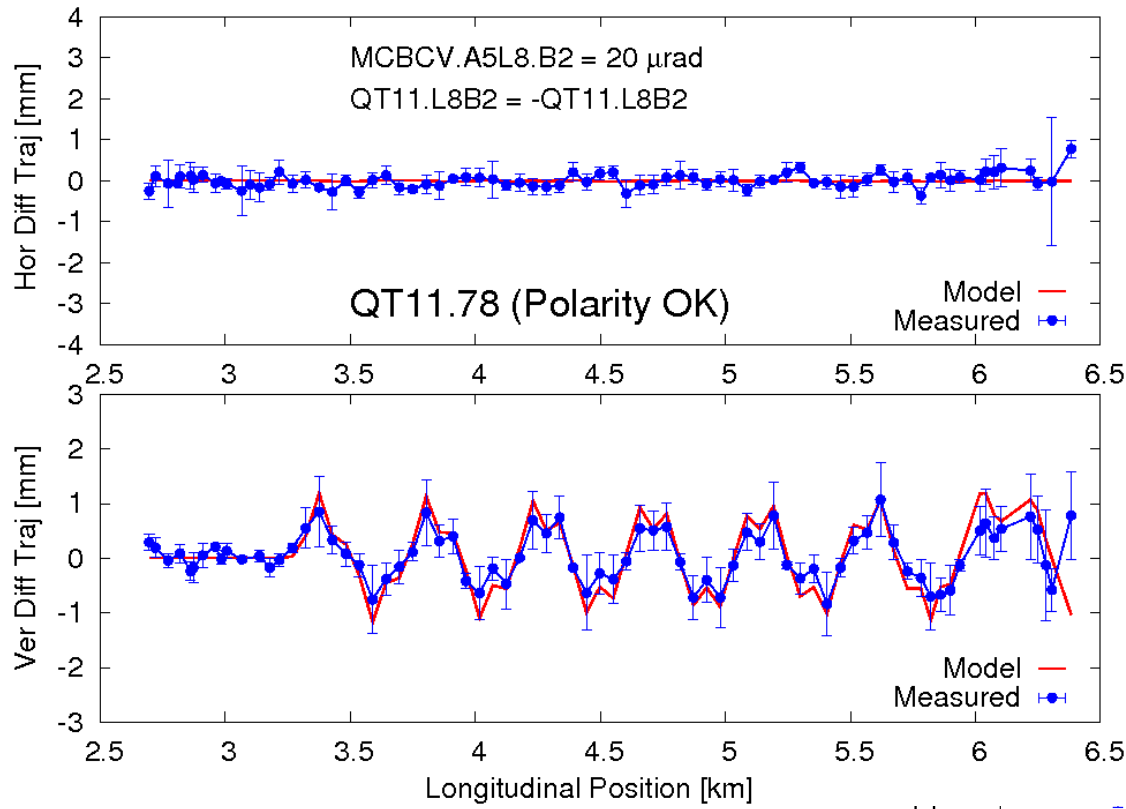
SF{1,2}, SD{1,2}, **MSS**, MCS

KOF, **KOD** ( $\delta p/p$  -or-  $D_{y, \text{initial}}$ )

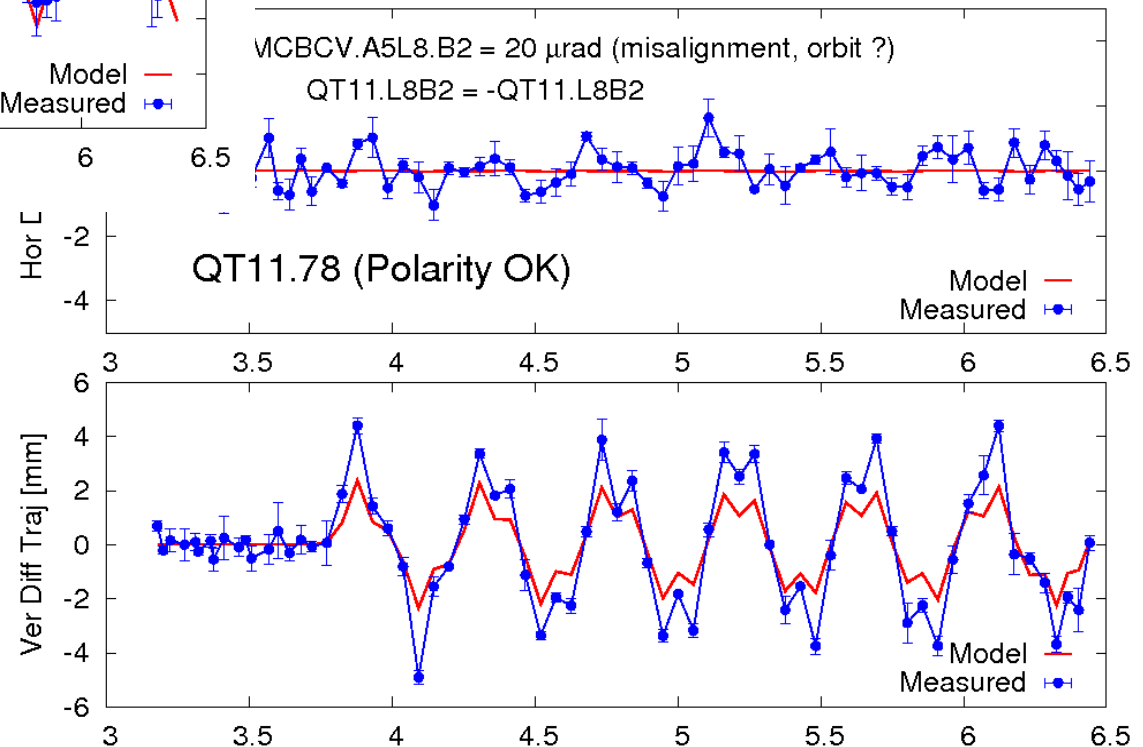
# SOME CORRECTORS, SECTOR 78



# QT11.L8B2, SECTOR 78



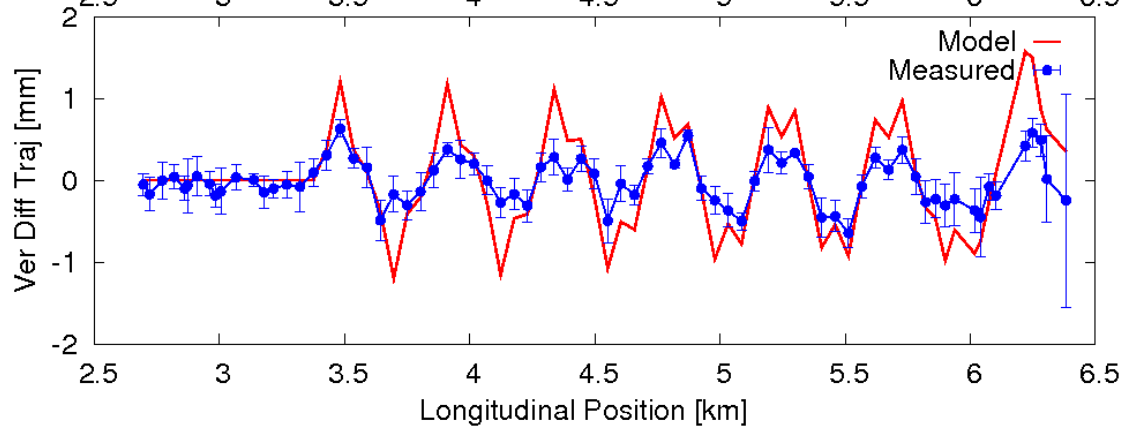
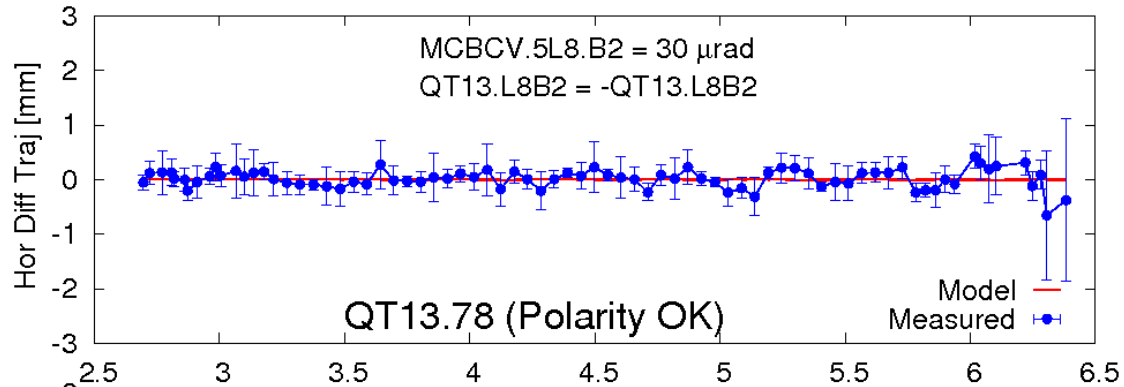
No discrepancy in 2009  
measurements



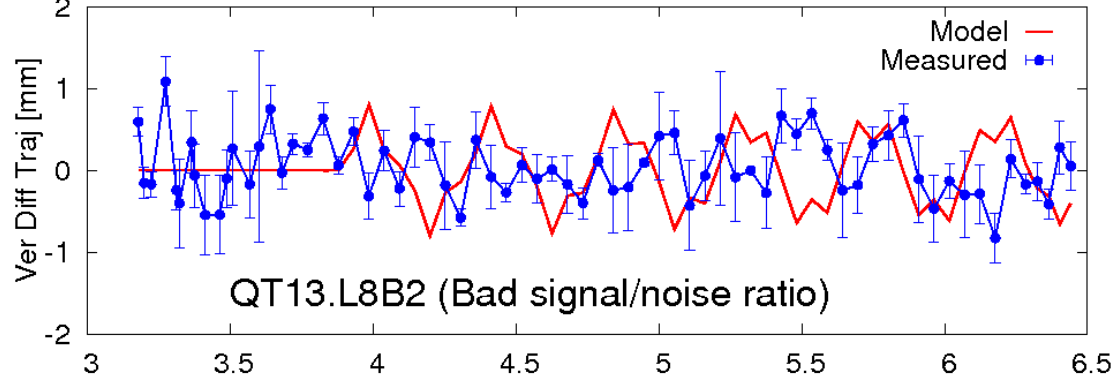
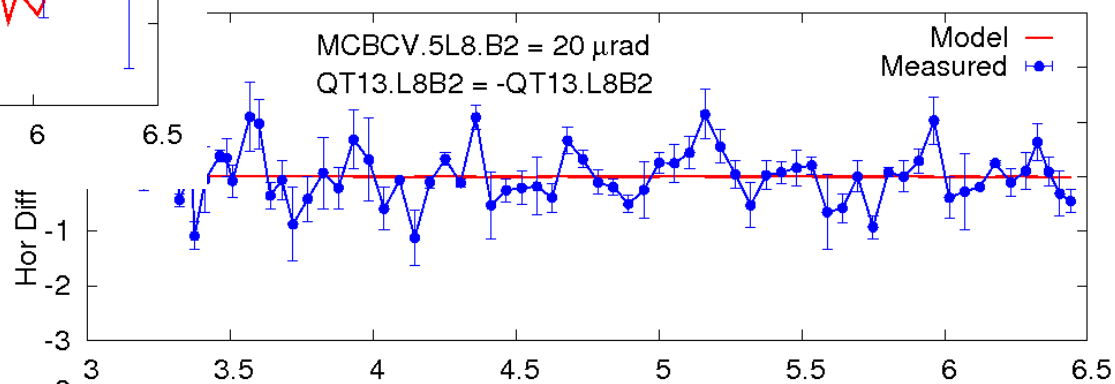
2008 Measurement

Amplitude discrepancy explained  
by misalignment of 3mm

# QT13.L8B2, SECTOR 78

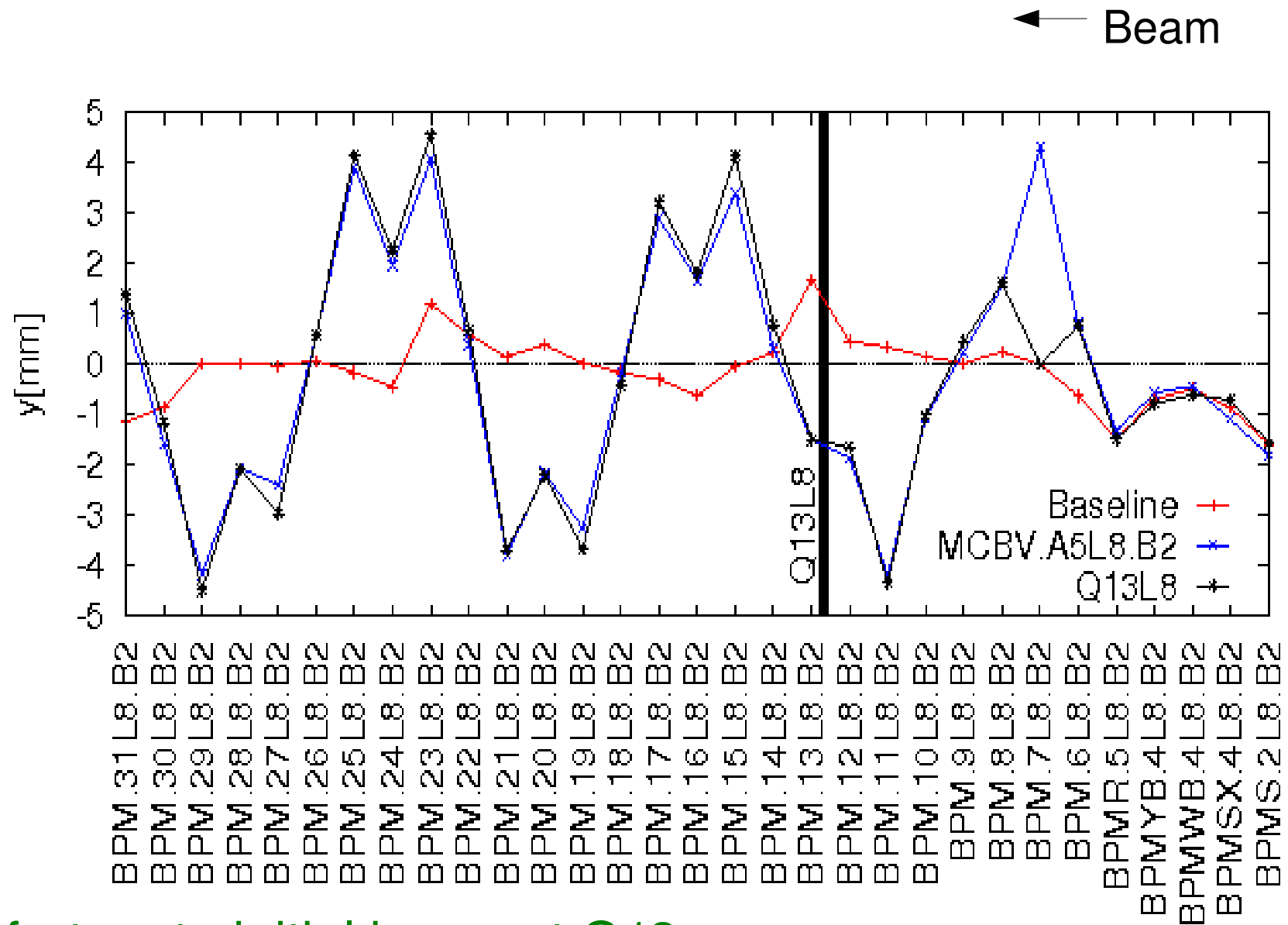


Polarity OK, but amplitude discrepancy (20 or 30  $\mu$ rad ?)  
2009



Data noisy, inconclusive: 2008

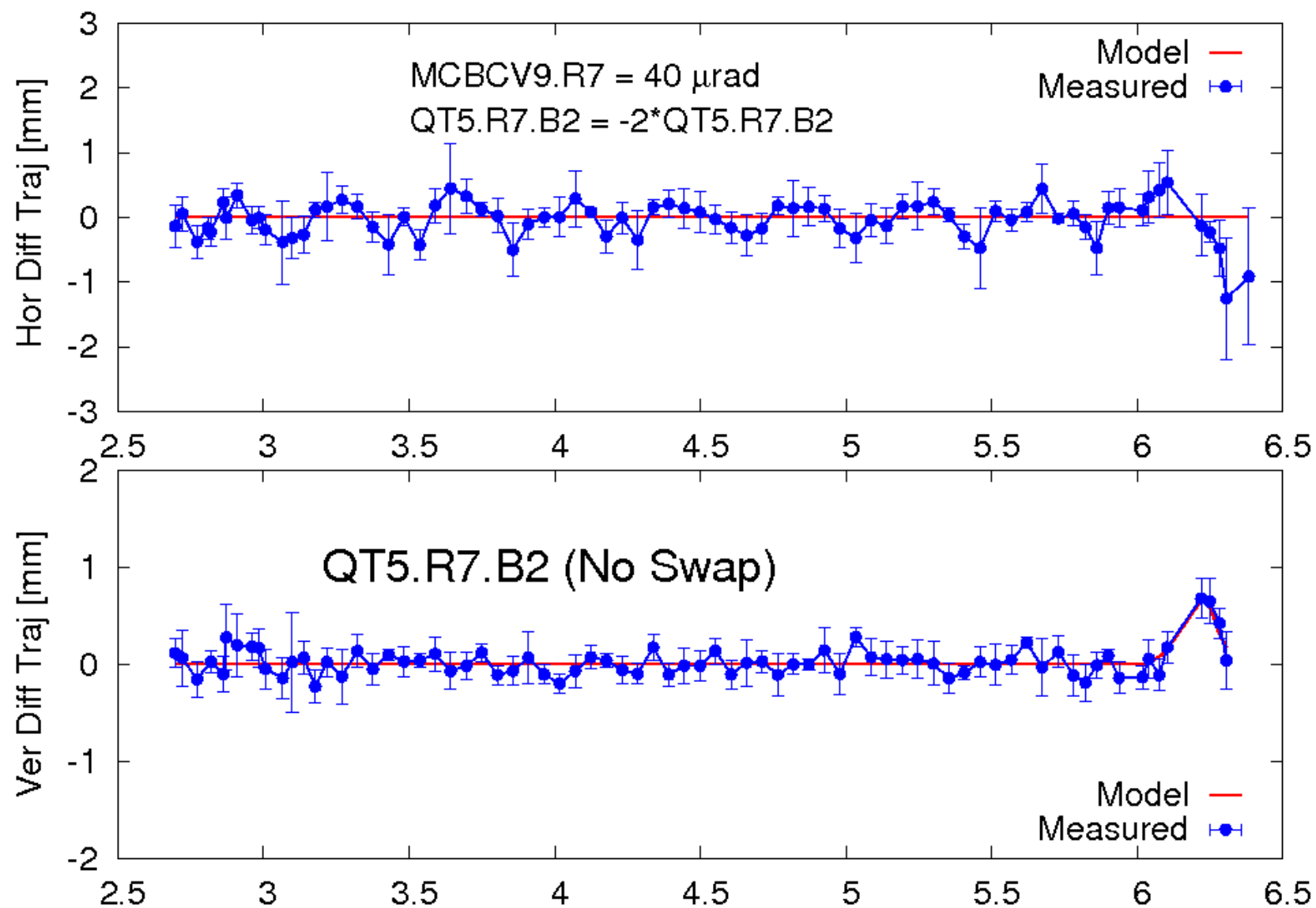
# QT13.L8B2, SECTOR 78, DISCREPANCY UNDERSTOOD



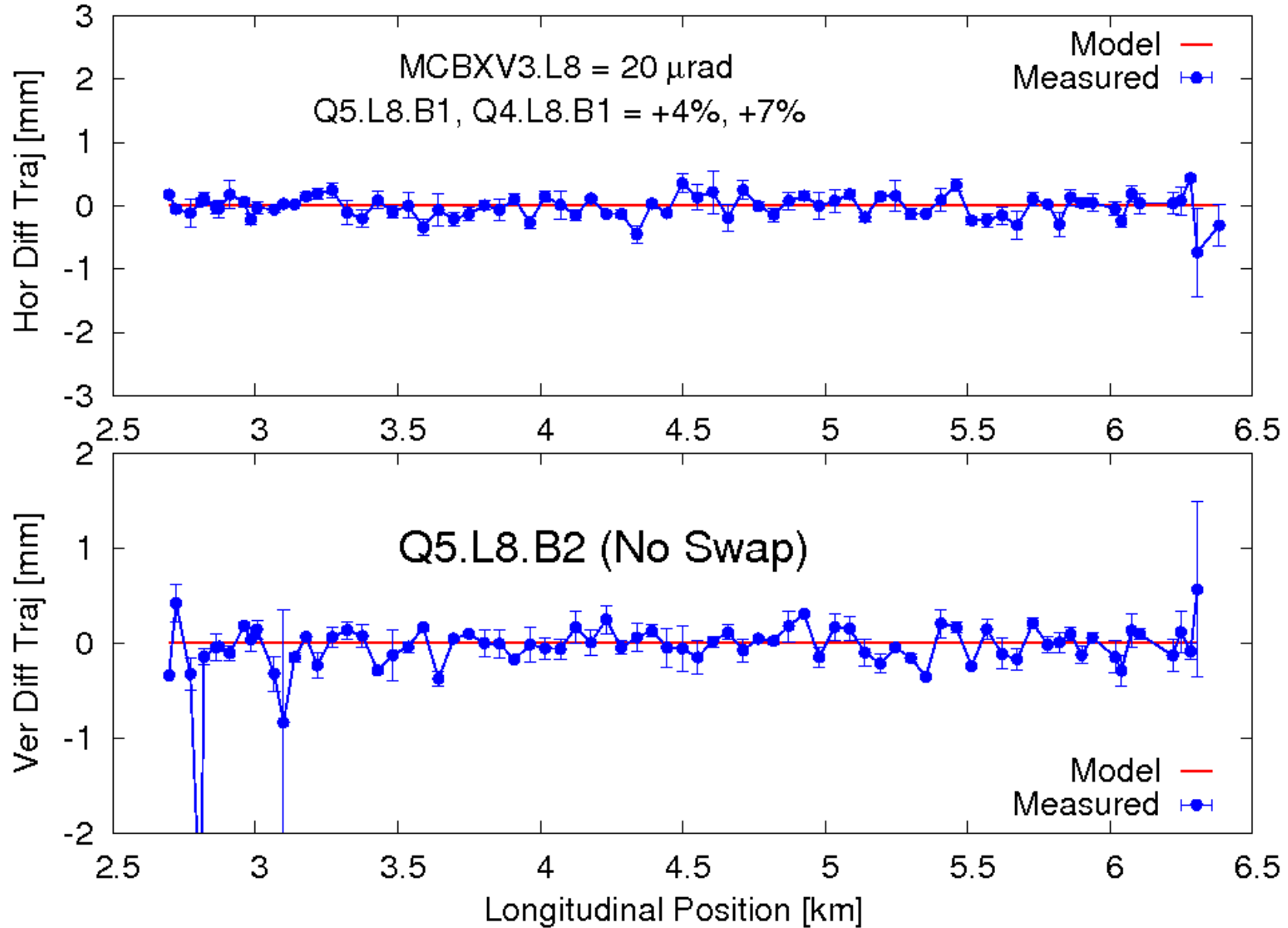
Unfortunate initial bump at Q13...

However polarity is confirmed to be OK

# QT5.R7B2, SECTOR 78



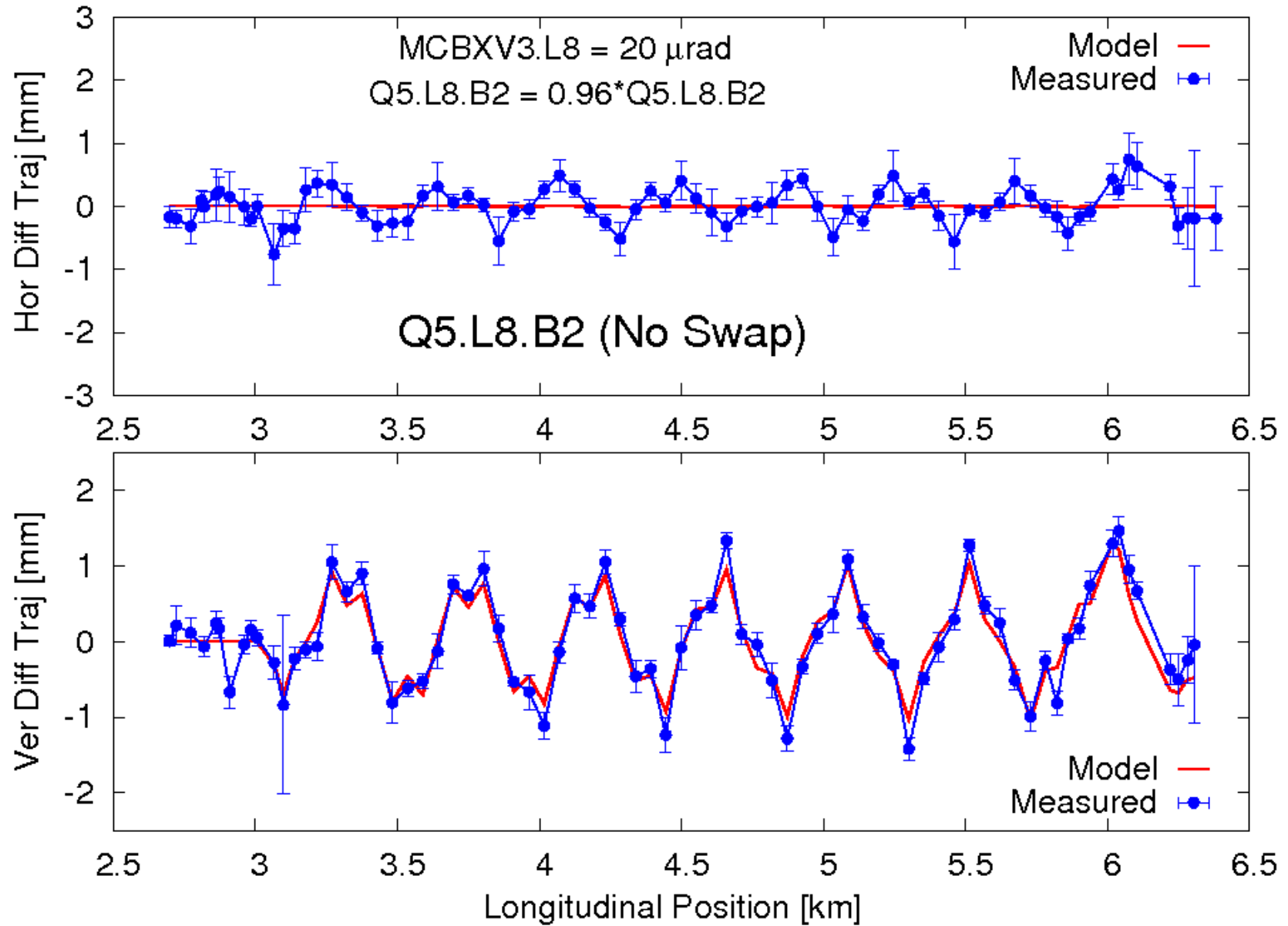
# Q5.L8B1, SECTOR 78



Q5.L8B1, Q4.L8B1 changed by  $\{4\%, 7\%\}$ , no effect  $\rightarrow$  No swap

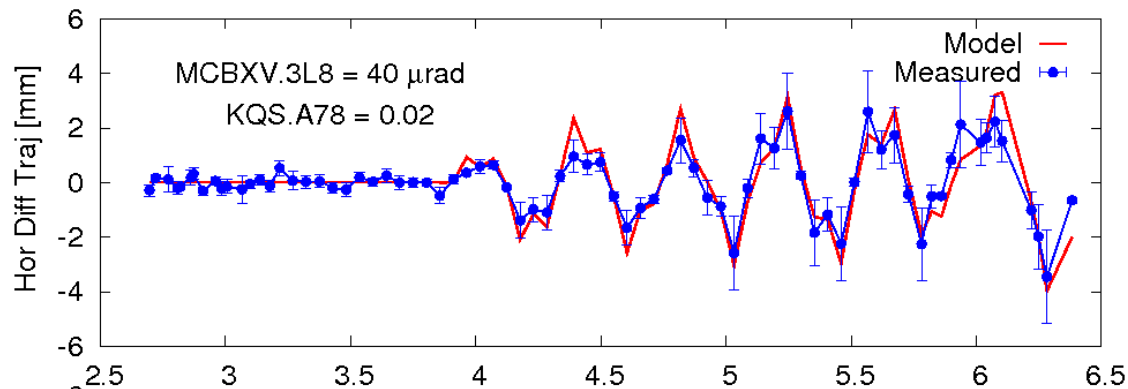


# Q5.L8B2, SECTOR 78

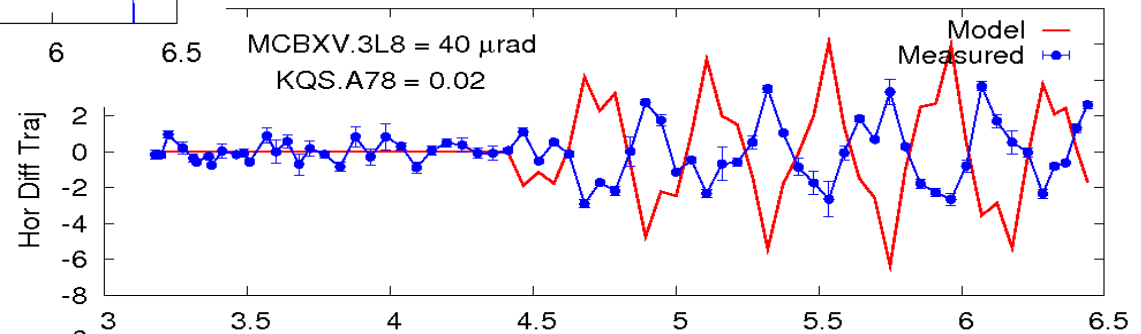
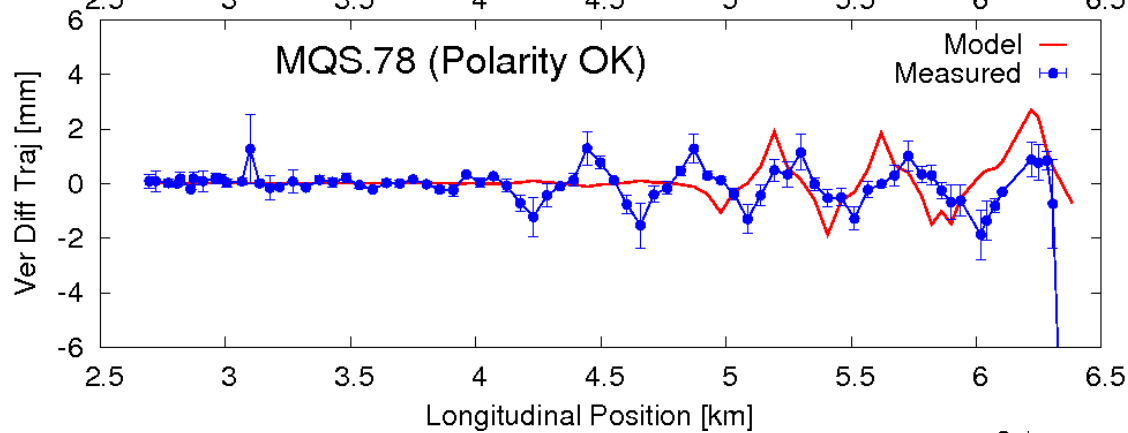


Changed Q5.L8B2 by 4%, no effect  $\rightarrow$  No swap

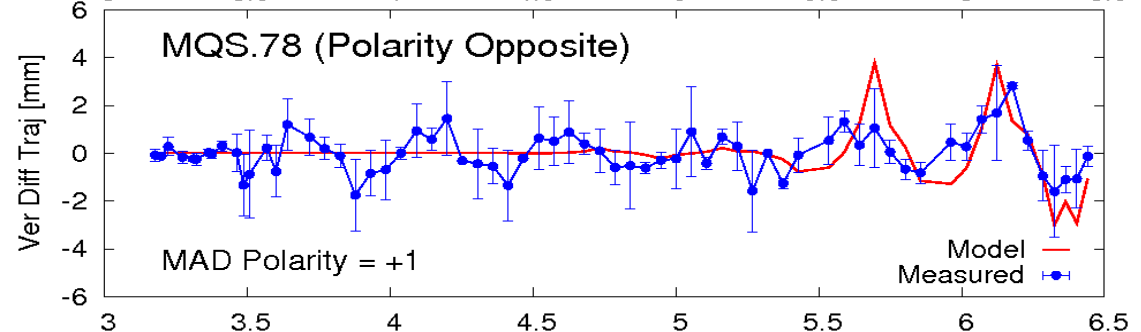
# MQS.78B2, SECTOR 78



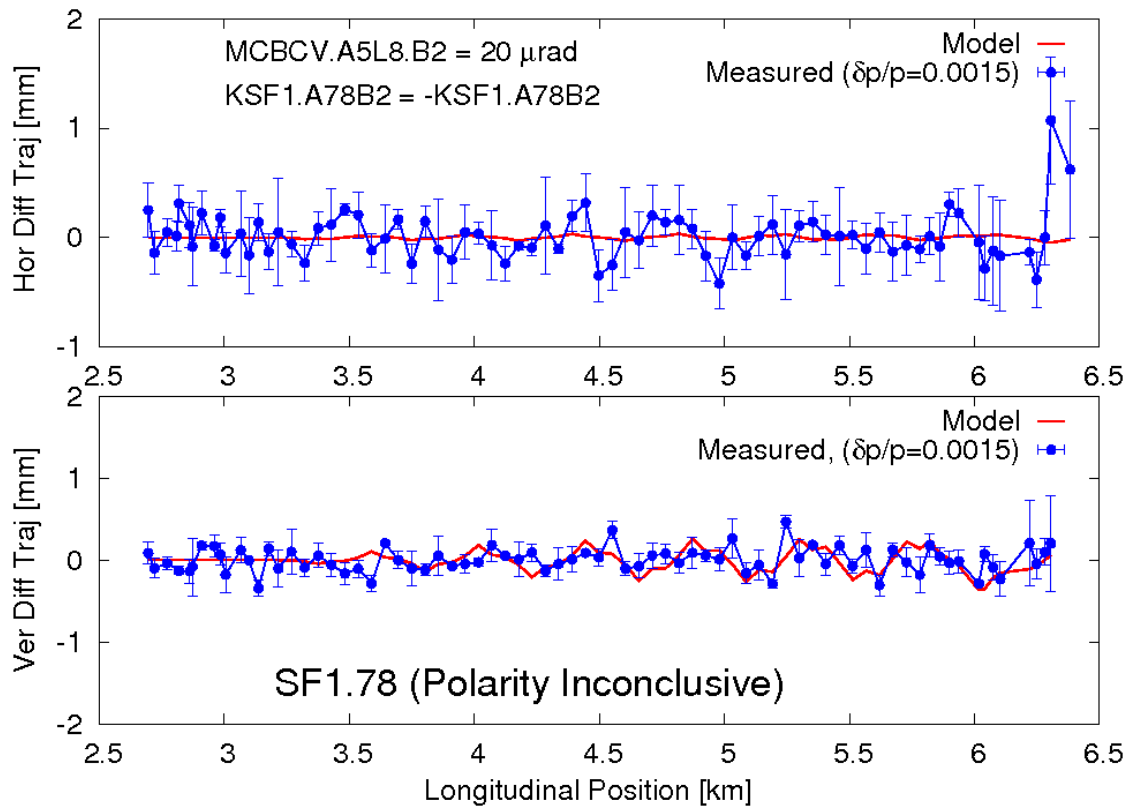
Polarity appears to be fixed. Vertical phase ?



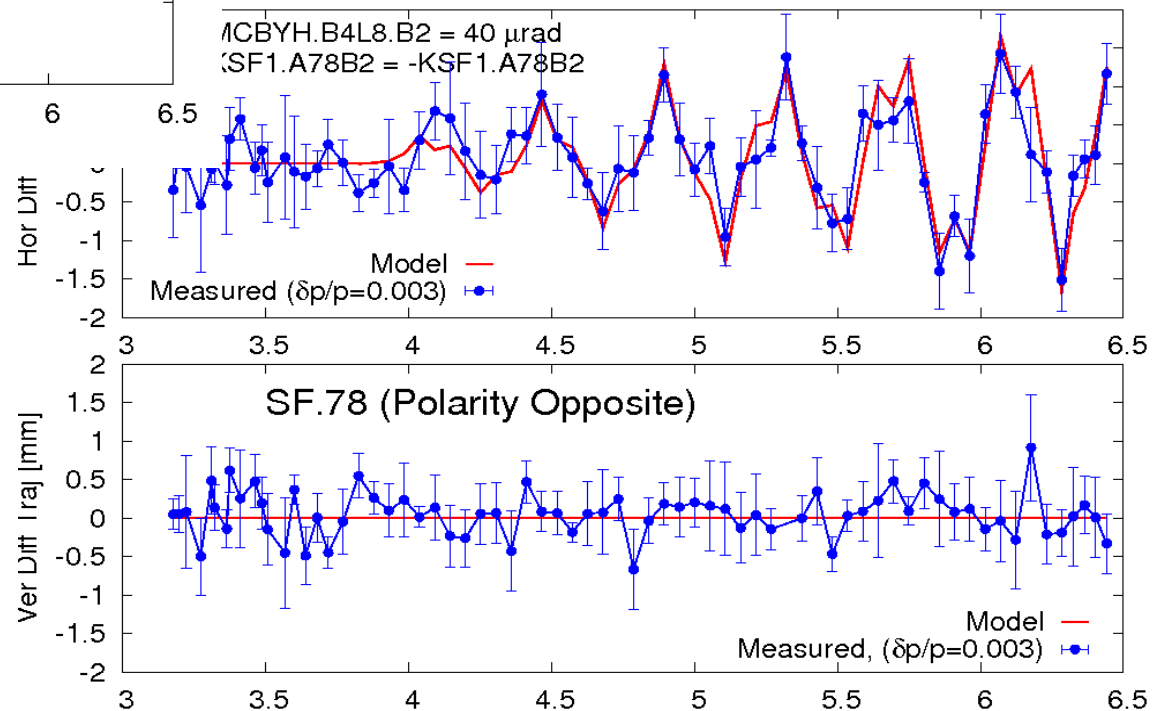
Predicted wrong polarity in 2008 tests, now ok



# SF1.78, SECTOR 78

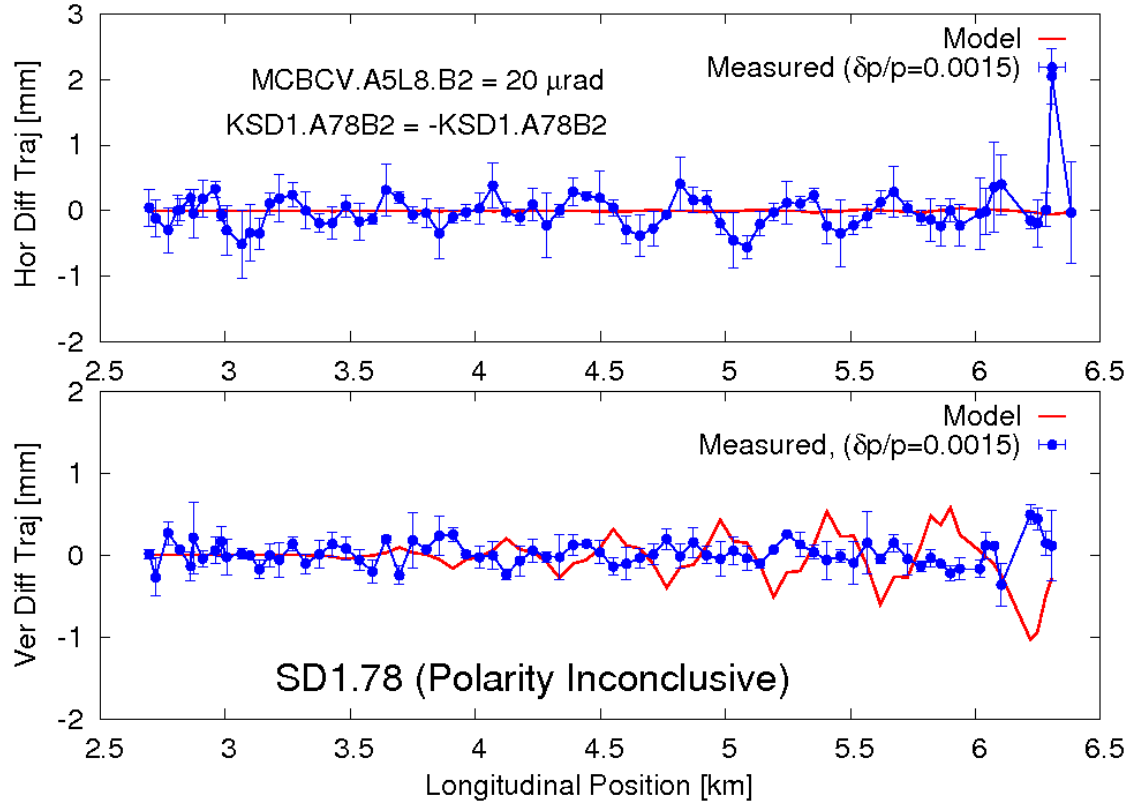


Polarity inconclusive,  
 $dp/p$  too small, 2009

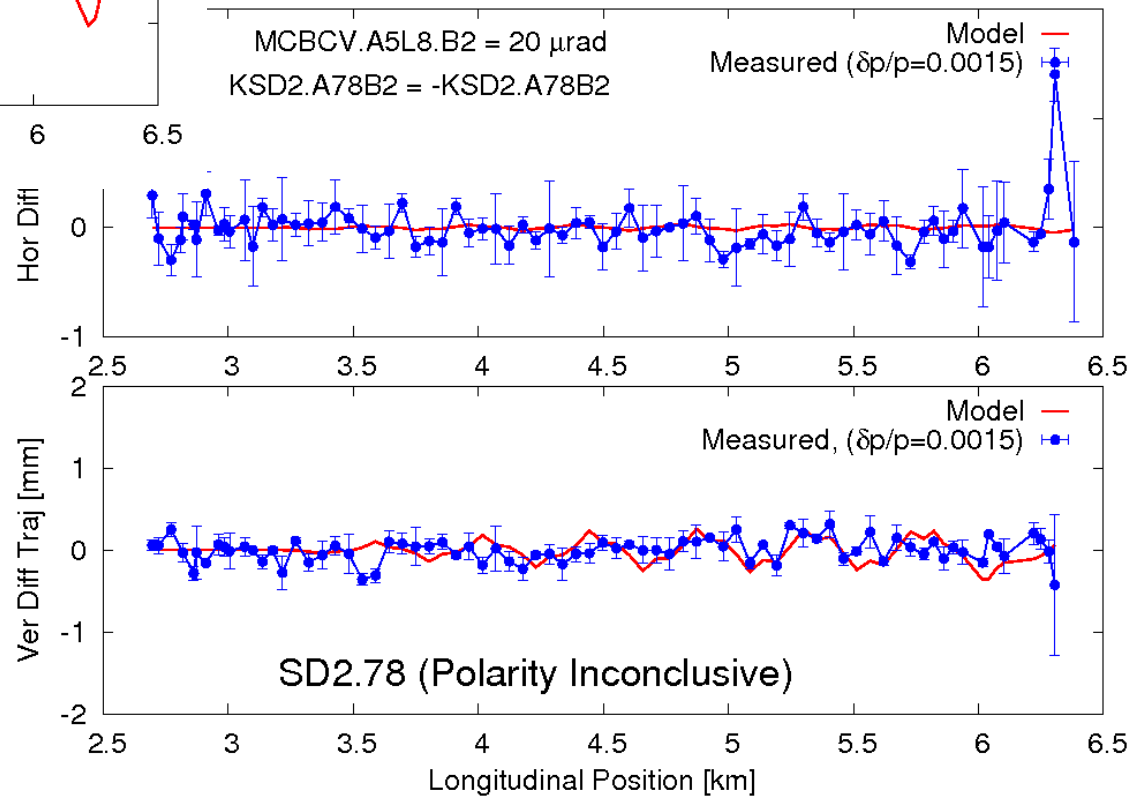


Polarity OK from 2008

# SD1.78 & SD2.78, SECTOR 78

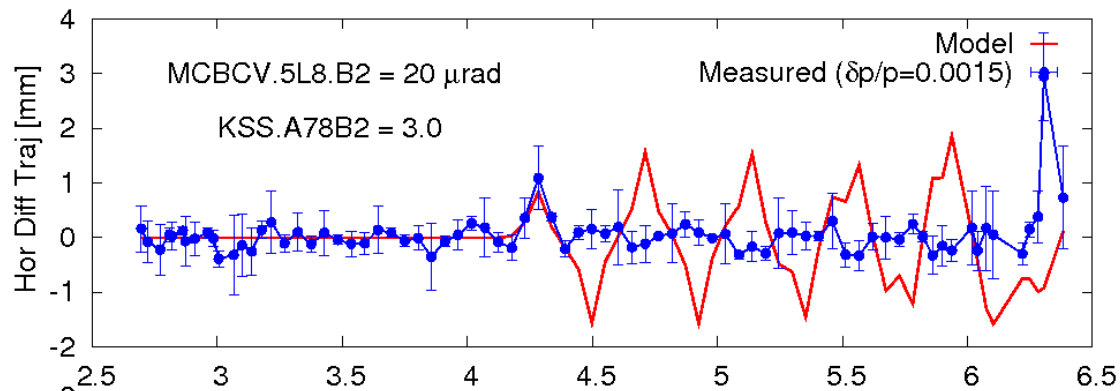


Polarity inconclusive,  
 $dp/p$  too small, 2009



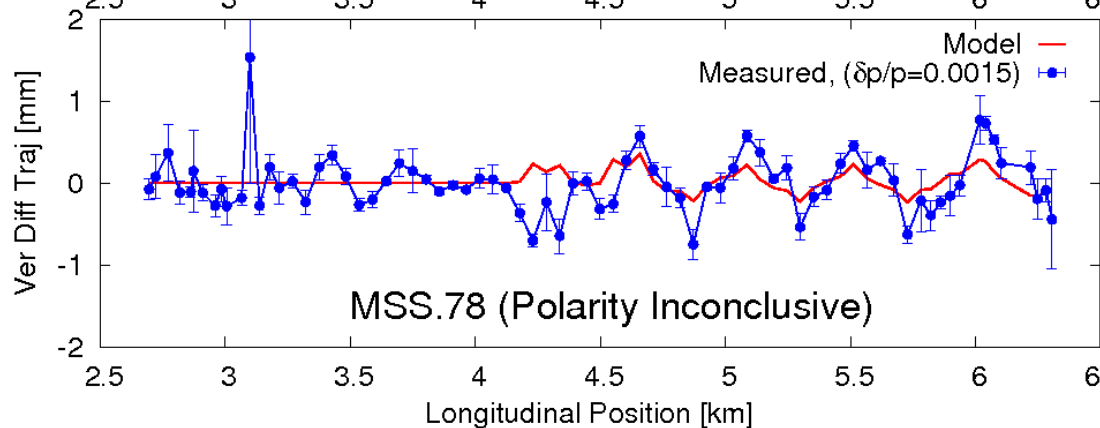
Polarity inconclusive,  
 $dp/p$  too small, 2009

# MSS.78, SECTOR 78

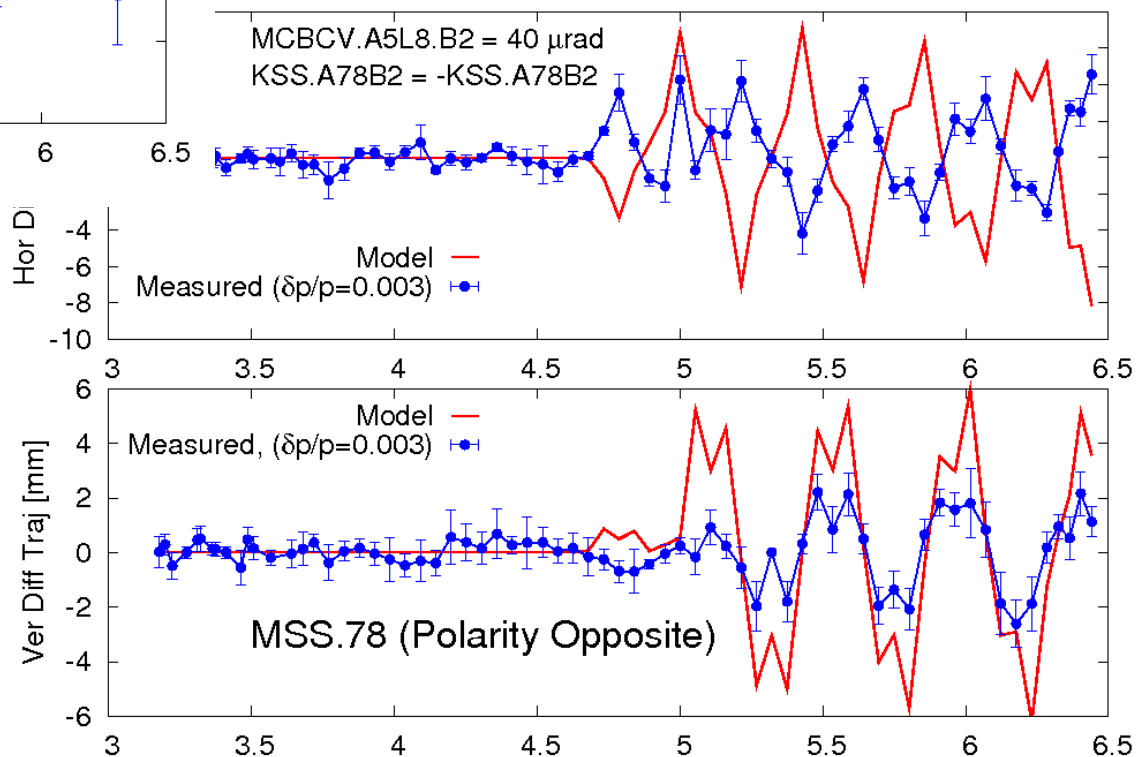


Polarity inconclusive, 2009

\*\* Sensitive to initial conditions



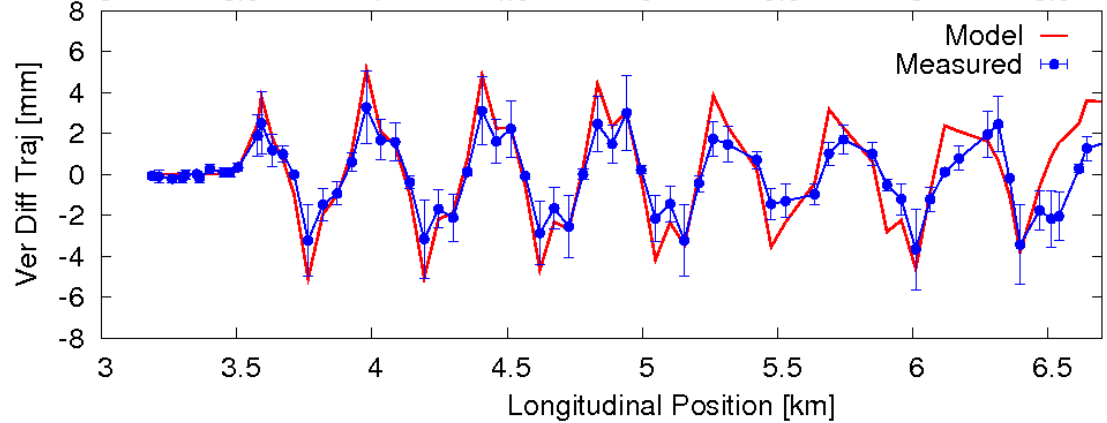
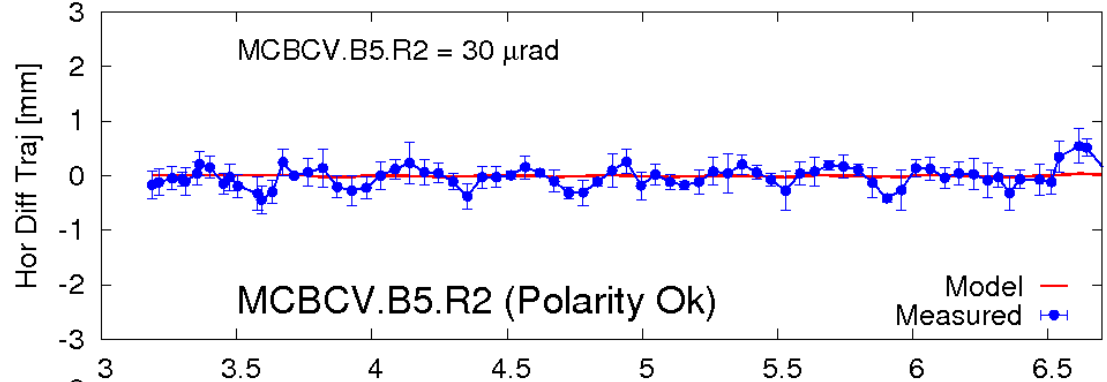
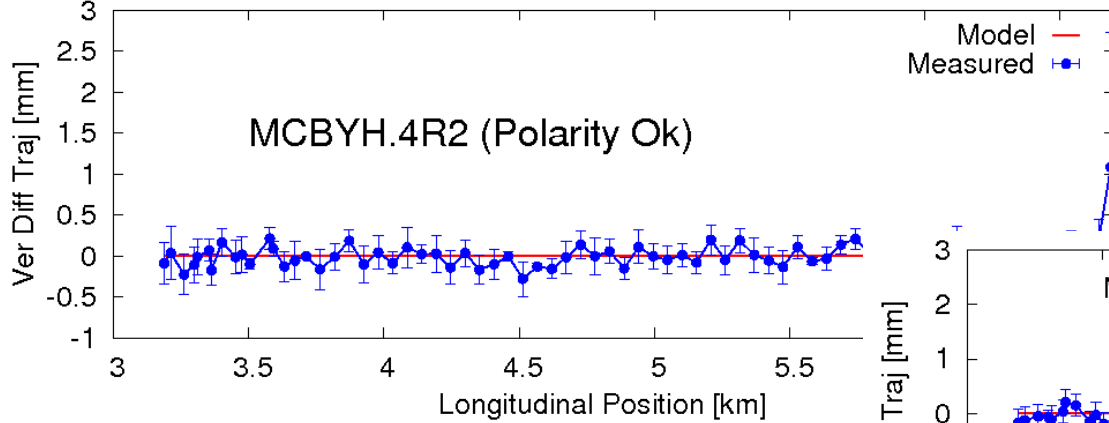
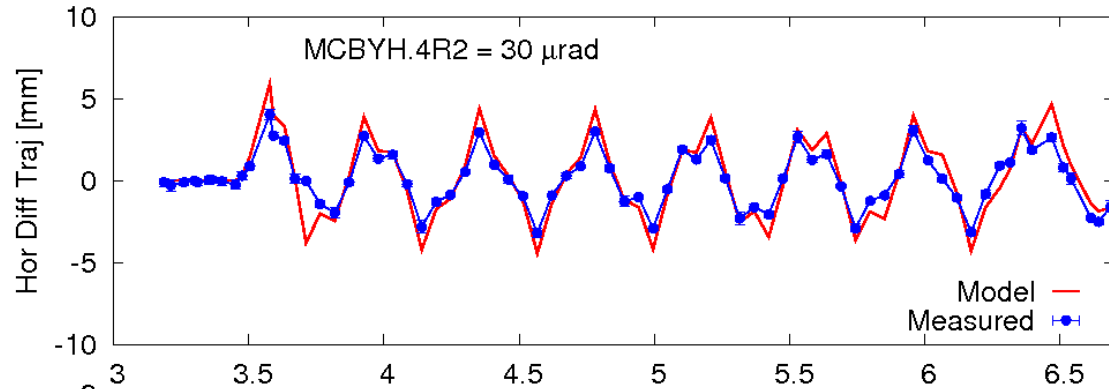
Predicted wrong polarity in  
2008 tests



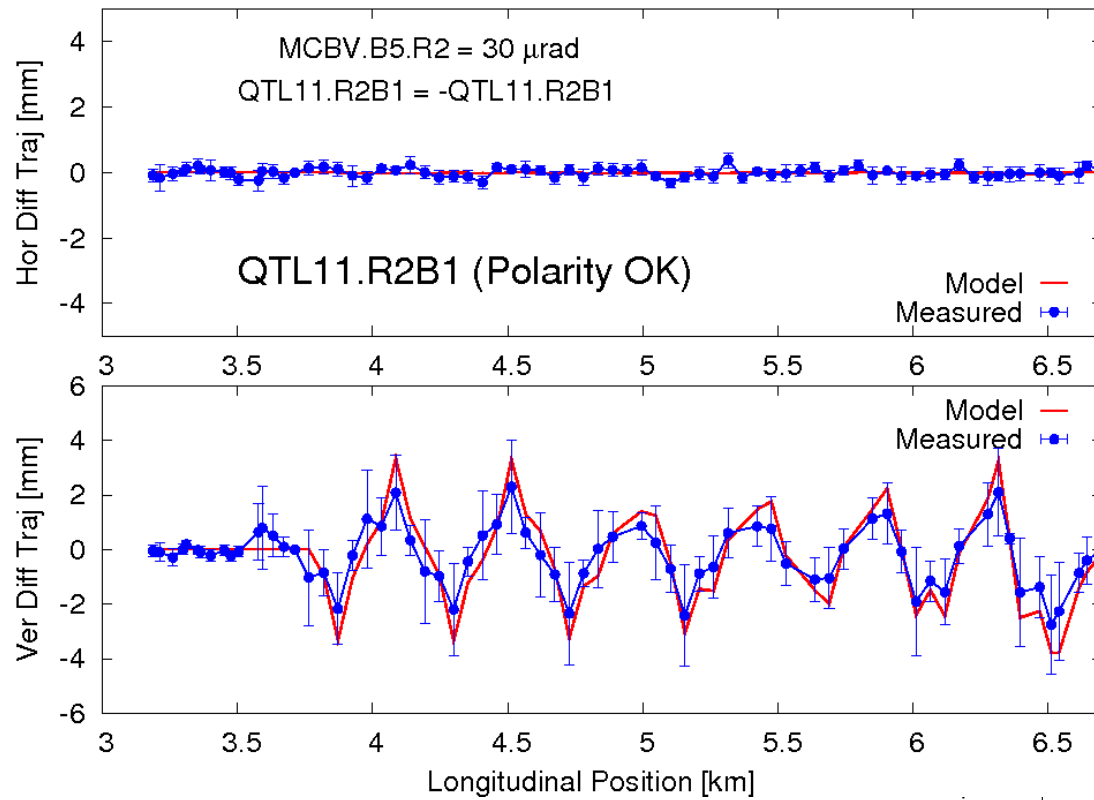
# SECTOR 23

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# SOME CORRECTORS, SECTOR 23

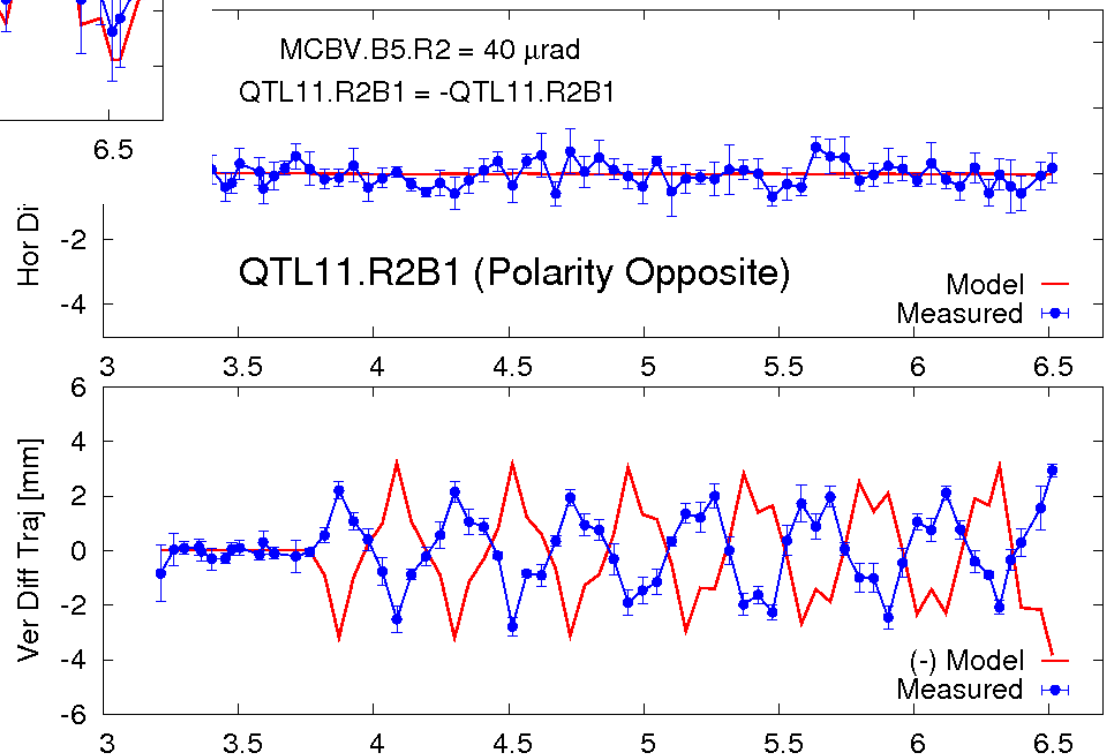


# QT11.R2B1, SECTOR 23



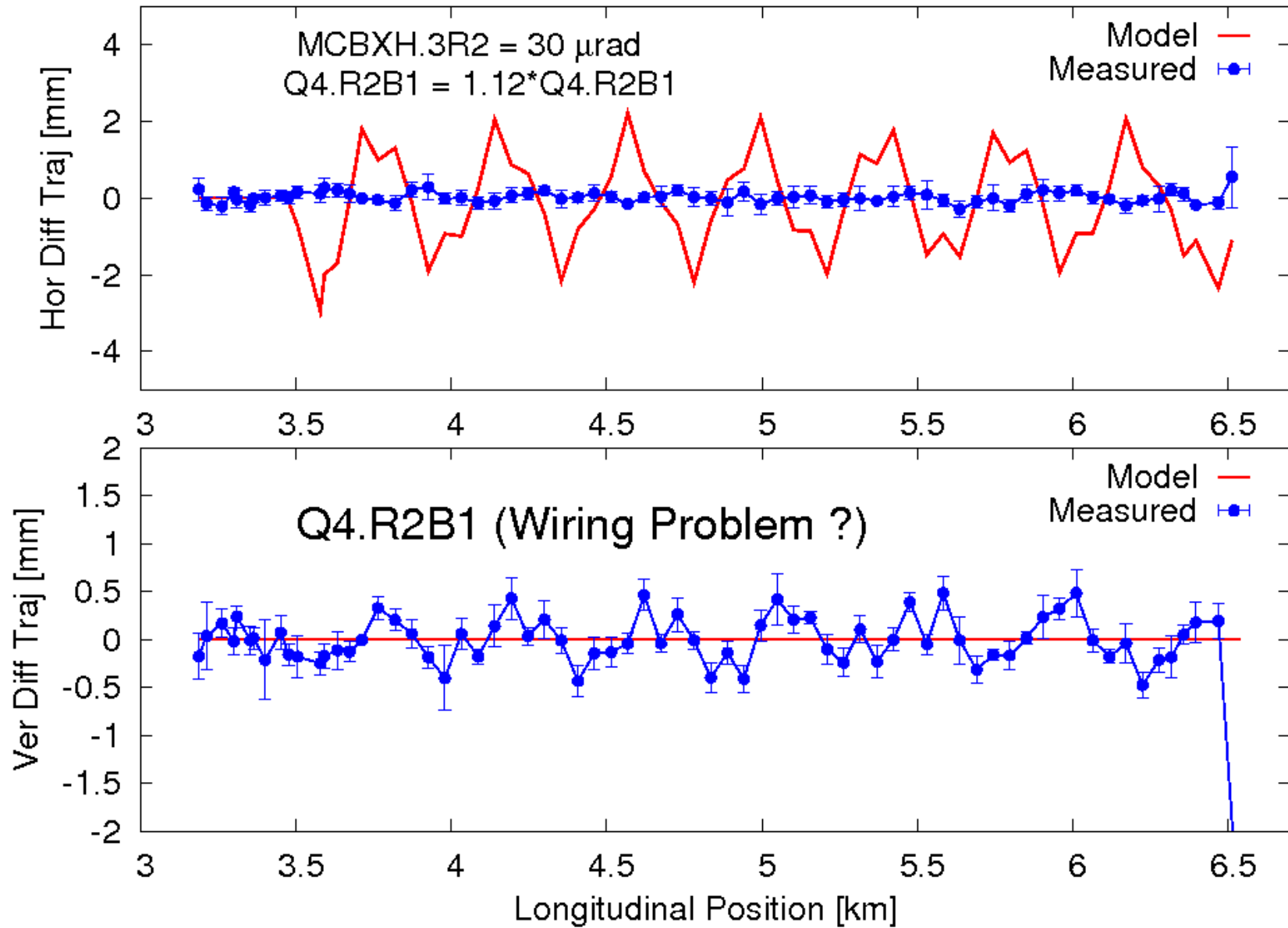
Polarity fixed, 2009

Predicted wrong polarity in  
2008 tests

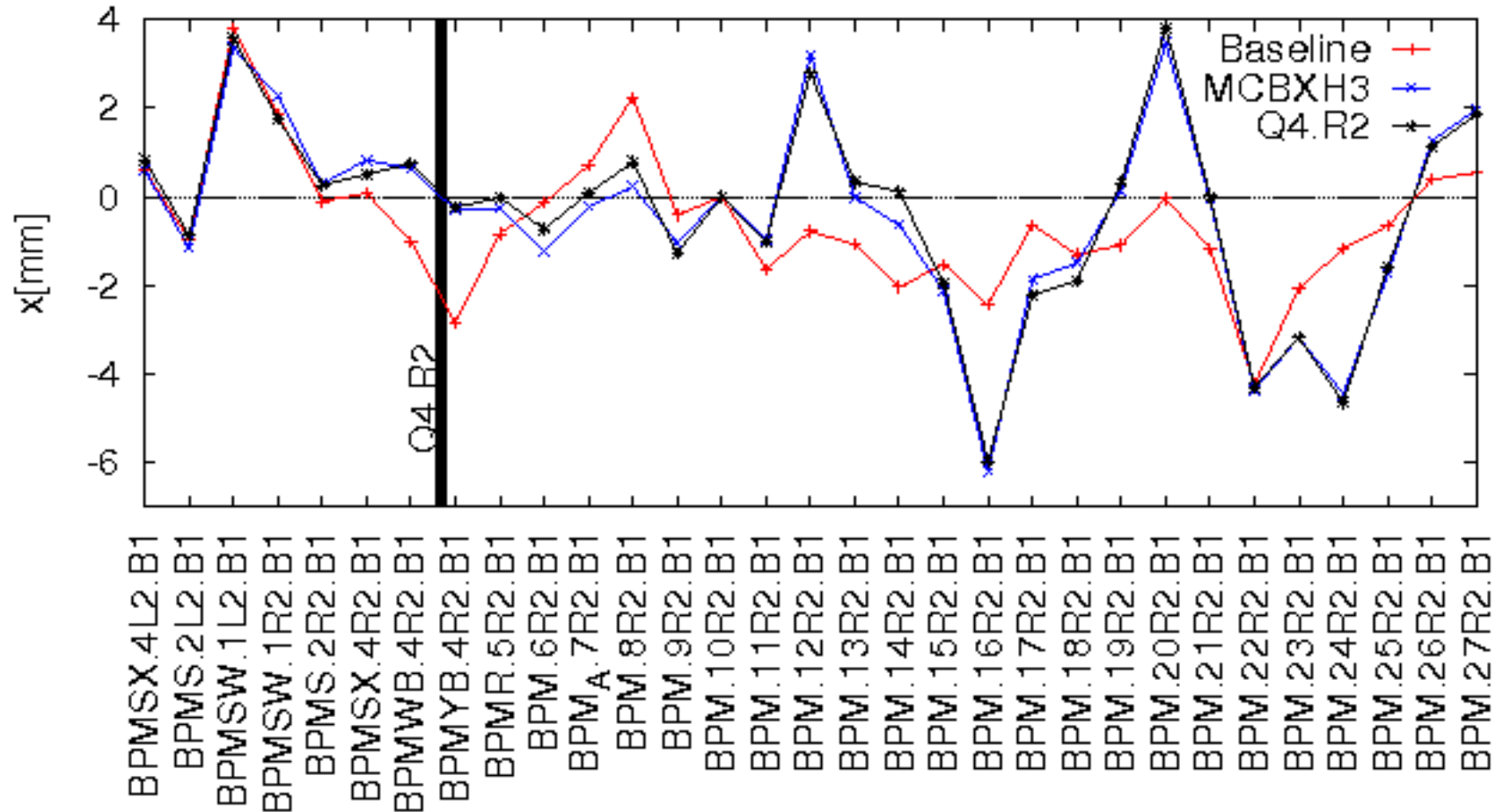




# Q4.R2B1, SECTOR 23

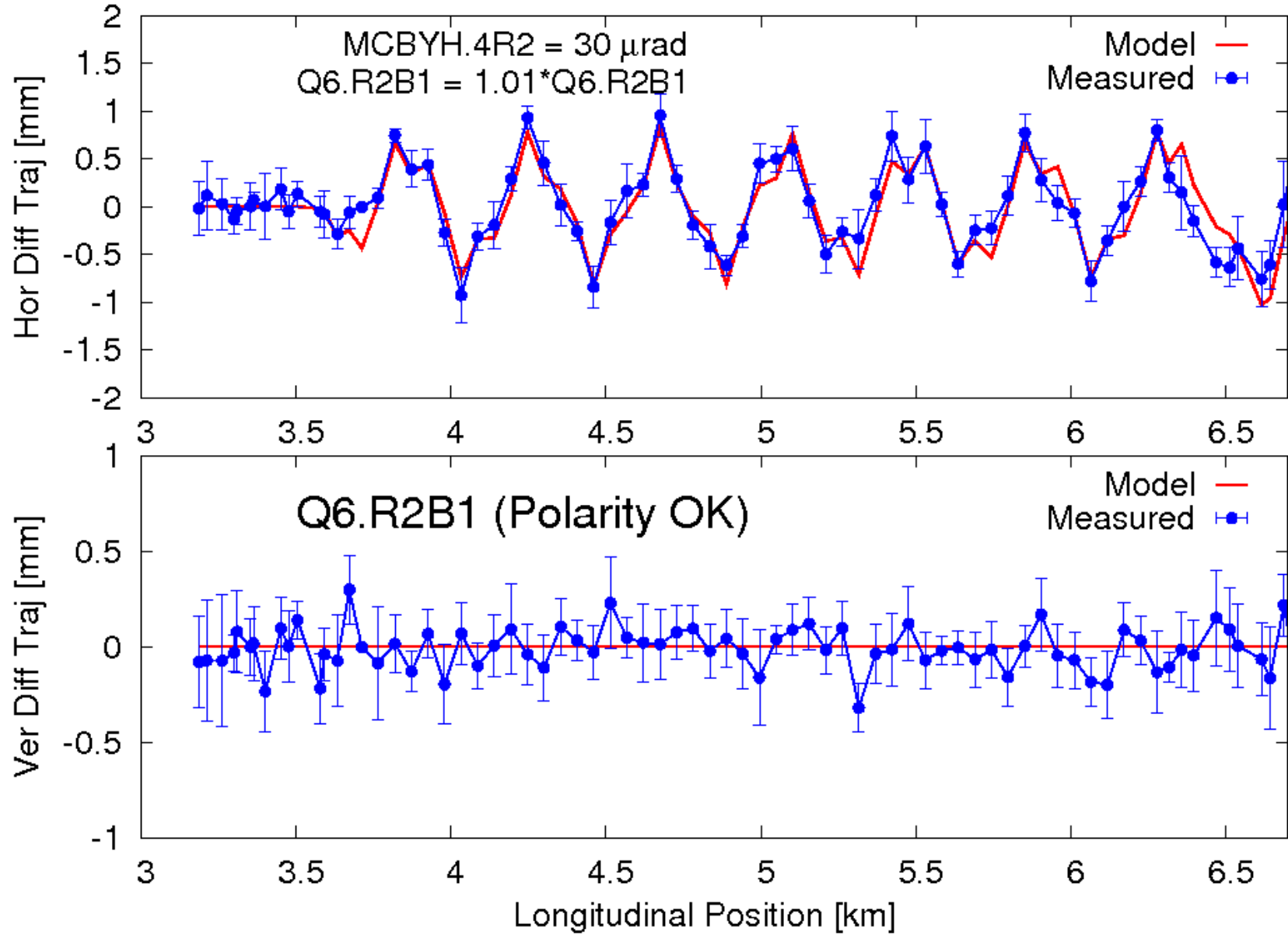


Also checked with B2 quads & other corrs: **NO RESPONSE**



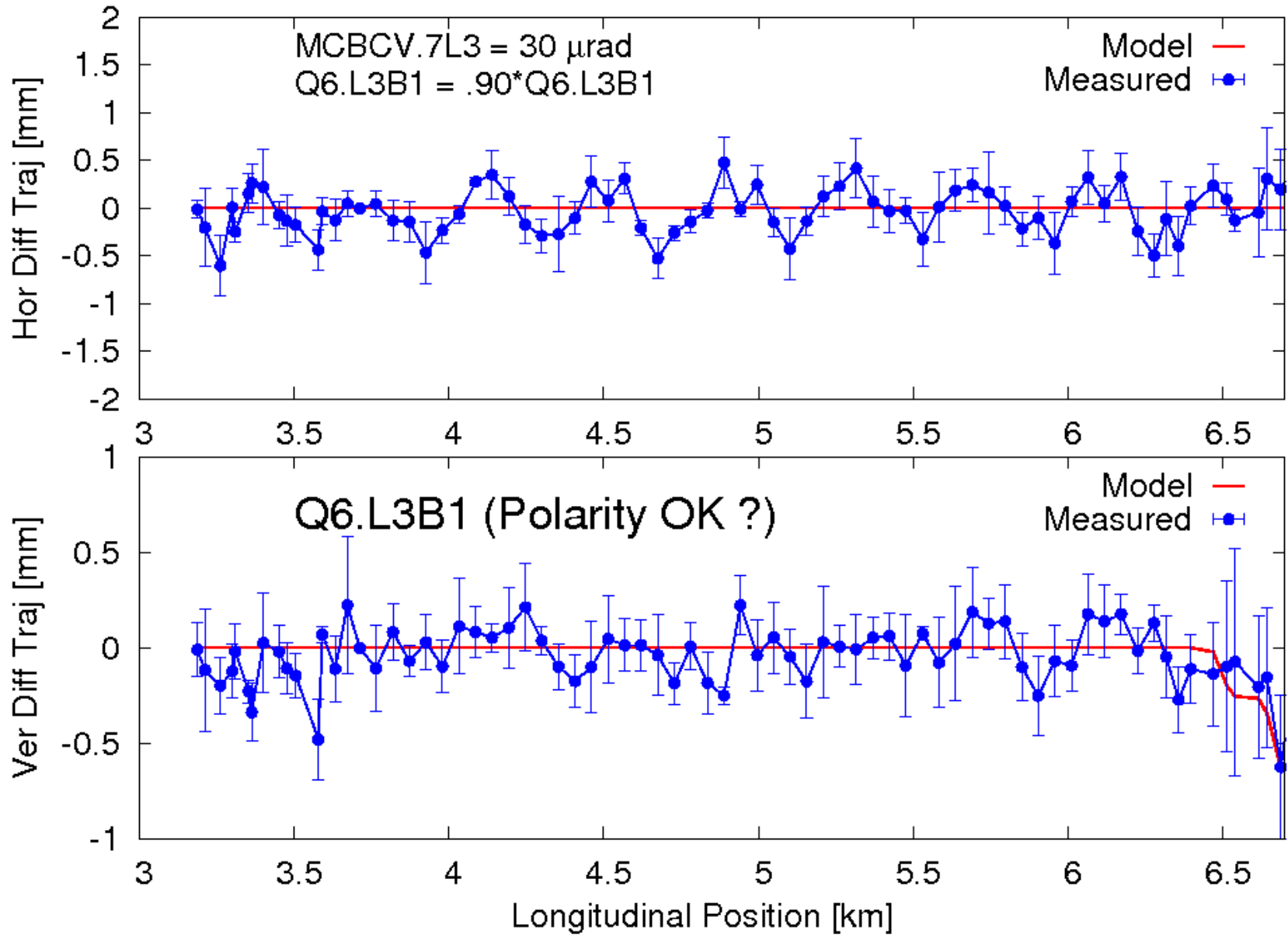
Very unfortunate initial bump at Q4R2 and MCBX strength...  
 Many other data for Q4B1 and Q4B2 still inconclusive...

# Q6.R2B1, SECTOR 23



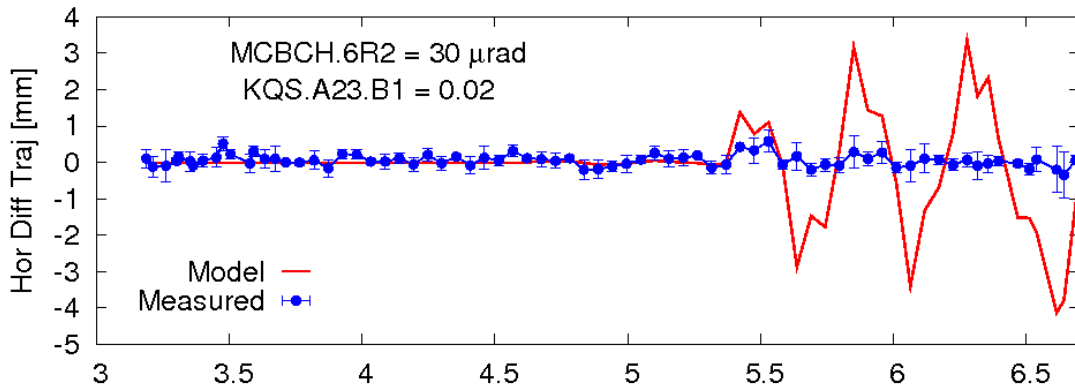
Beta-beat candidate for polarity, no problem

# Q6.L3B1, SECTOR 23

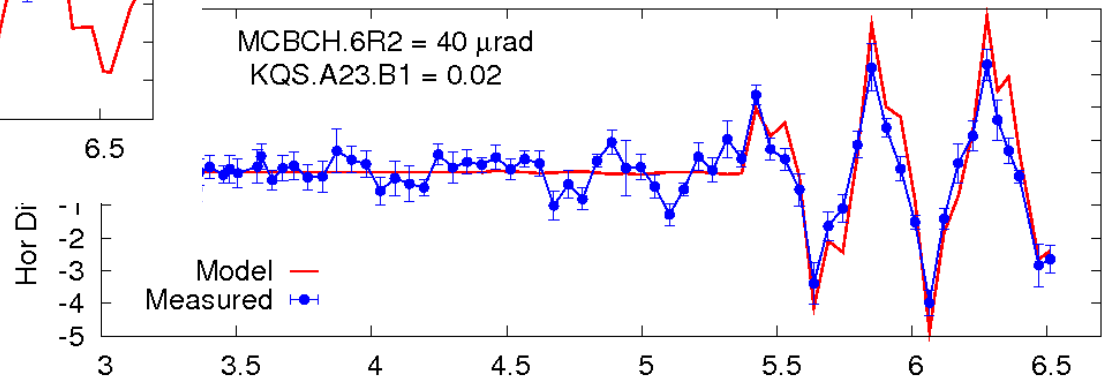
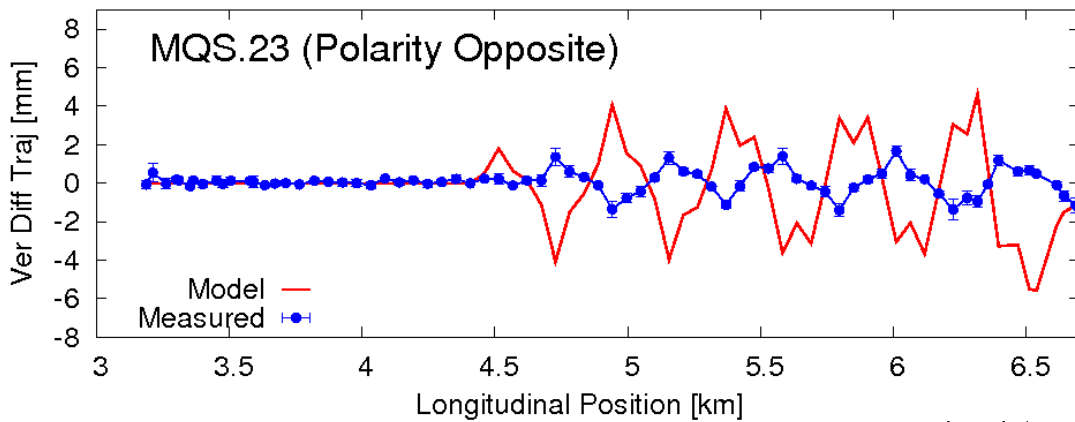


Beta-beat/hardware candidate for polarity, inconclusive

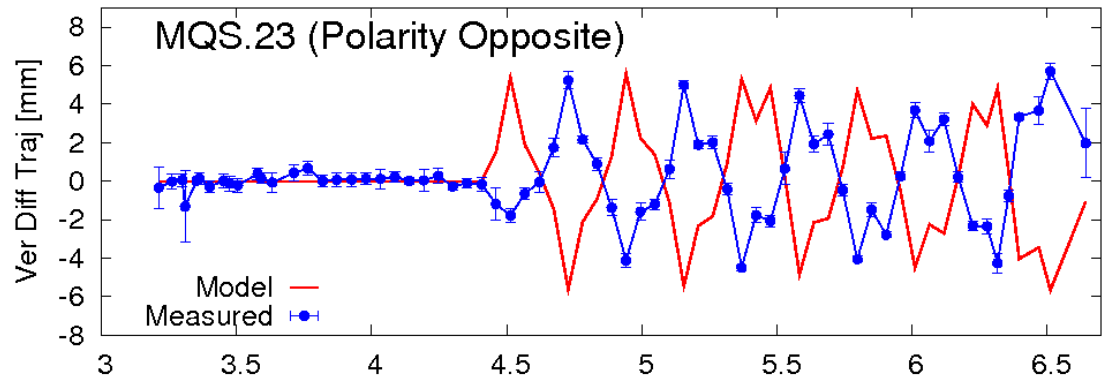
# MQS.23B1, SECTOR 23



Also, predict wrong polarity



Predicted wrong polarity in  
2008 tests



# SOME COMMENTS

Circuits	Sector 23 2008	Sector 23 2009		Circuits	Sector 78 2008	Sector 78 2009
QT11.R2	Wrong	Fixed		QT11.L8	Misalign (?)	Fixed
Q4.R2	$\beta$ -beat	No Response		QT13.L8	Inconclusive	OK , ,
Q6.R2	$\beta$ -beat	OK		Q5.L8	Suspicious	OK
Q6.L3	Hardware	Inconclusive		QT5.R7	Suspicious	OK
MQS.23	Wrong	Wrong		MQS.78	Wrong	Fixed
MSS.23	Not tried	Not tried		MSS.78	Wrong	Inconclusive
SF[1,2].23	OK	Not tried		SF[1,2].78	OK	Inconclusive
SD[1,2].23	Not tried	Not tried		SD[1,2].78	OK	Inconclusive
KOF.23	Not tried	Not tried		KOF.78	OK	Not tried
KOD.23	Not tried	Not tried		KOD.78	Inconclusive	Not tried

Fixed: Either in LSA or due to “updated” MADX convention

(?): Polarity OK but amplitude or phase discrepancy

Sextupole & higher order: dp/p too small, all results inconclusive

# DRAFT PLAN FOR NEXT INJECTION TESTS

- Re-do Q4R2 with debugged software and on-line model
- Do Q4L2 (corrector from T12)
- MSS.23 if  $dp/p > 0.002$  (or find another way)
- SD[1,2].23 (idem)
- For ARC78 there is only MSS.78
- If ARCs 34 and/or 67 are available, plenty of stuff to do