EUROPEAN SOUTHERN OBSERVATORY
Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

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VERY LARGE TELESCOPE

Prima Metrology 8th Technical Report
1-10 Nov.2010
(as part of PRIMA COM13)

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Issue

Date:

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CHANGE RECORD

Issue	Date	Affected Paragraphs(s)	Reason/Initiation/Remarks

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1 INTRODUCTION

2 USEFUL NUMBERS AND CONVERSION FACTOR

1 arcsec_sky=250microrad ACU
1 pix IRIS ~ 36 microrad ACU
0.45 micron_piezo_fsm=1 arcsec_sky=20units [Alignment offset]

Maximum OPL speed of DL and DDL ($v_{OPLmax} = \lambda \Delta\nu/2$)
DL
Specs: 450,650kHz±55kHz leading to $v_{OPLmax} = \pm 36$mm/s
As built: 450,650kHz±75kHz leading to $v_{OPLmax} = \pm 49$mm/s,

DDL
Specs: 200kHz±27.5kHz , leading to $v_{OPLmax} = \pm 18$mm/s
As built: 200kHz±34.5kHz, leading to $v_{OPLmax} = \pm 23$mm/s

3 SUMMARY

- Remove straylight of PRIMET on STRAP : DONE, low pass filter mounted on STRAP/STS.
- Check compatibility of PRIMET with tilt control:
  - field stabilization: DONE, field stab. limit ~Vmag=11
  - Check compatibility of PRIMET with IRIS guiding: DONE, OK. New strategy for IRIS background measurement implemented to avoid crossing the M10 edge by P.Gitton and A.Ramirez.
  - IFG: to be done
- Evaluation/tuning of the pupil tacking loop: DONE, performance are back to normal. (pure delay of 75msec as experienced during the last run is back to normal ~<20msec)
- Assess the compatibility/robustness of PRIMET to various PRIMA stimuli:
  - FSU DARK/FLAT calibration
    - calibration with ACU: not compatible with original offsets (controlled amplitude but uncontrolled direction). Offset with controlled direction initiated, to be tested more extensively.
    - calibration with the FSM: compatible with PRIMET for offsets opposite to the sts edge.
    - generally, the required Dark/Flat calibration period shall be assessed. The dark/falt does not require the metrology to be running. so to which extend can this calibration be done

outside of the swap/unswap sequence when the metrology is required (potential gain of time and robustness).

- DL preset (to the same target): not compatible with PRIMET.
  - The preset is only used during the swap/unswap to change the FSU of the OPDc, although the DL shall always keep tracking on the primary during the whole astrometric template.
  - During preset, the VCM is deflated and inflated again even if the preset is done on same target. This kills the metrology. A work around was found during COM13 by Philippe.
  - A preset of the DL to the same target will represet it with a >1 hour tracking time.
  - A rate limiter must be integrated in the DL (as in the DDL)
- DL fringe search/scan: a rate limiter needs to be implemented in the DL. Step offsets of tens of mm introduces glitches (i.e offset to OPDc after a fringe scan to compensate for OPD model errors). TBC if the offset can be included in the blind trajectory (avoid step when a fringe search is started after a swap)
- DDL preset/Swap: OK with rate limiter of 2000. Maximum rate limiter to be tested
- Telescope swap: Currently not compatible because the fsm are dragged away (and potentially the beams cross the edge). Exact origin to be assesed.

- PRIMET software updated to improve diagnostics,operation and robustness (see Robert's summary for the details)
- New osf scripts were implemented:
  - priosfPRIMET_NIGHT_TO_DAY.osf;
  - priosfPRIMET_DAY_TO_NIGHT.osf;
  - priosfPRIMET_PREPARE_STS.osf for engineering test during day time on the STS
- All PRIMET data logs collected during operation on wprima are now available on http://autrep.pl.eso.org/autrep2/pages/
- PRIMET succesfully operated in parallel with FSU dual fringe tracking and scanning. These results can be use to obtain FSU sky calibration data.
- Frequent self-reboot of the DDL after Init

sftp wpacman.hq.eso.org
login: vlti (nice password)
path: /data/pacmanDATA

4 MO 1/11/10

Activities

- Installation strap filter on AT3-STS
- Initial field stabilization test with PRIMET laser

5 TU 2/11/10

Activities and results

- Installation strap filter on AT4-STS
- Pupil tacking test:
  - Fix noise injection as user guiding offsets
  - Large beam wandering from AT4-J2-B (4 diameters in few seconds): effect of air conditioning ?of SW re-installation ? or I light duct being open?. use atosfDayTimetests.osf. To be checked in COM14 in more details
- Check PRIMETB:
  - Problem with electronics quadcell IP4-> sw PGA gain selection does not work; unit replaced on 3/11
  - P2 and IP4 observed on beam profiler with flip mirrors B OUT:
    - IP2: P=0.068 mW [0.088 mW measured during COM12]
    - IP4: P=0.029 mW [0.024 mW measured during COM12]
- Check PRIMETA: works OK,

SUMMARY:

COM12

* FSUB AUTOTEST COM12
B TTP1(IP2) X=-244.1 microrad (-224 ?); Y=141.1 microrad
B TTP2(IP4) X=10.54 microrad ;Y=256.8 microrad
* FSUB AUTOTEST COM13
B TTP1(IP2) X=-235.9 microrad ; Y=115.5 microrad
B TTP2(IP4) X=10.70 microrad ;Y=223.9 microrad

➔ Very similar values

IP1 AT3-A			
	COM12	* IP1 TRA=5.6 PGA=1 SUM=2.2V AT3_VCMA X=29.8 Y=12.75	
	COM13	* IP1 TRA=5.6 PGA=1 SUM=2.6V AT3_VCMA X=28.6 Y=12.5	1D along +U
IP2 AT3-B			
	COM12	* IP2 TRA=1 PGA=100 SUM=6.4V AT3_VCMB X=19.85 Y=21.37	
	COM13	* IP2 TRA=1 PGA=100 SUM=4.7V AT3_VCMB X=17.66 Y=20.93	
IP3 AT4-A			
	COM12	* IP3 TRA=5.6 PGA=1 SUM=2.9V AT4_VCMA X=**21.8** Y=8.6	
	COM13	* IP3 TRA=5.6 PGA=1 SUM=3.15V AT4_VCMA X=**25.08** Y=9.7	**Δx~3.3**; 5D along +U
IP4 AT4-B			
	COM12	* IP4 TRA=1 PGA=100 SUM=6.8V AT4_VCMB X=26.3 Y=23.8	
	COM13	* IP4 TRA=10 !!PGA=100!! SUM=0.8V AT4_VCMB X=29.4 Y=25.2	3D along -U

➔ Max difference after~1.5 month= 3.3 microns_piezo

IP1 and IP3 (A beams) as well as IP4 are far from theoretical (19,19):

- Alignment of STS-A beams?
- Coupling PRIMETA alignment error/STS alignment errors ?

(check max value of radial offsets during whole commissioning during pupil traking (1/ standard tracking 2/ tracking with stimuli-> DDL swap) to give free range necessary

Open enclosure:

Record phase meter eng file with fixed **DL2&4=14m and DDL=0**

AT3-G2-DL2-IP1: OPL0=97m

AT4-J2-DL4-IP3:OPL0=158m

> OPD~61m

RMS from fringe board

REFB=140mV PROBEB=272mV

REFA=190mV PROBEA=126 mV

MetQuadCentroids2010-11-03T00.34.24.849018.txt

Total recording time= 30 sec

```
% IP3 IM Gain A1 A2 B1 B2 1 0 0 -1 0.04 -0.875 0 -1 0
% IP1 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.02 -0.875 0 -1 0
% IP4 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.04 -0.875 0 -1 0
% IP2 IM Gain A1 A2 B1 B2 1 0 0 -1 0.02 -0.875 0 -1 0
```

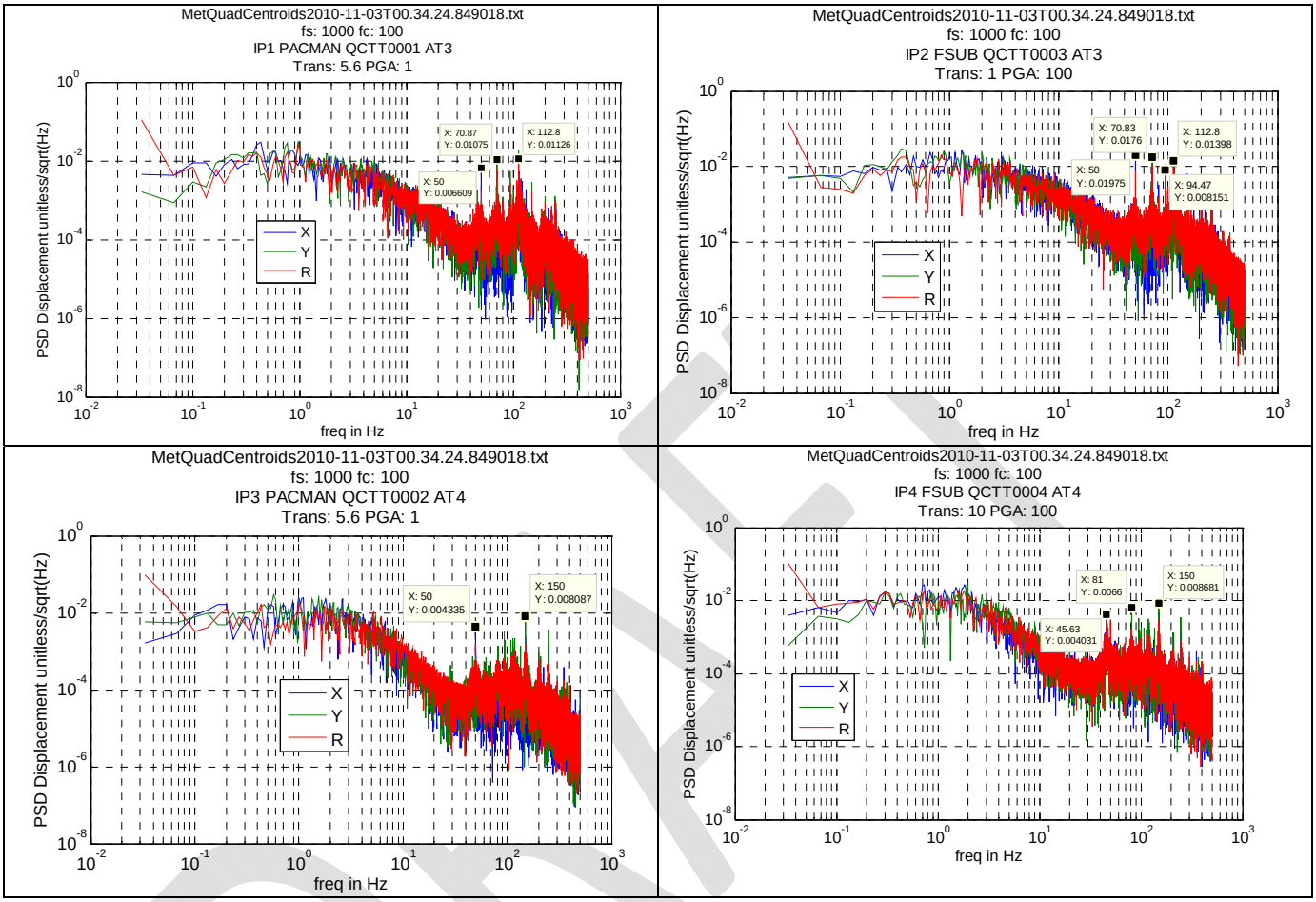
Ip1: in spec, R_Pk= 1.032274e-001 ;PV Rcorr= 8.5e-2

Ip2: R_Pk= 1.325282e-001 p

IP3: R_Pk= 0.15 p PV Rcorr= 23e-2

IP4: R_Pk= 1.033155e-001 p PV Rcorr= 13e-2 (lower flux due to SW gain problem)

➔ Larger corrections on Ip2&4



IP1: (PRIMET A, S beam , AT3)

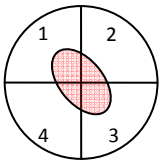
Mean Q1 = 6.751478e-001 V

Mean Q2 = 5.750233e-001 V

Mean Q3 = 6.737954e-001 V

Mean Q4 = 5.749152e-001 V

Sqrt(Q2/Q1)=0.91(~ε ?)



IP2 (PRIMET B, S beam , AT3)

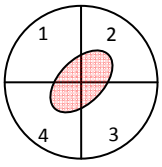
Mean Q1 = 9.893362e-001

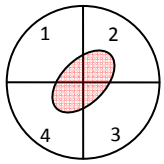
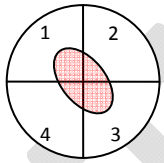
Mean Q2 = 1.386536e+000

Mean Q3 = 9.929255e-001

Mean Q4 = 1.384845e+000

Sqrt(Q1/Q2)=0.84



IP3 (PRIMET A, P beam , AT4) Mean Q1 = 6.432133e-001 V Mean Q2 = 9.431120e-001 V Mean Q3 = 6.429486e-001 V Mean Q4 = 9.425469e-001 V Sqrt(Q1/Q2)=0.82	
IP4 (PRIMET B, P beam , AT4) Mean Q1 = 2.234064e-001 Mean Q2 = 1.846713e-001 V Mean Q3 = 2.237454e-001 V Mean Q4 = 1.845481e-001 V Sqrt(Q2/Q1)=0.91	

Origin of the ellipticity:

- ellipticity of Gaussian beam and rotation w.r.t quadcell [X,Y] axes
- beam incidence angle not perpendicular to quadcell surface

Phase Meter Data

==> Filename: lprmacPhaseMeter2010-11-03T00.34.41.734898.txt

Sampling frequency= 300 Hz
Number of samples= 9000
DeltaL Mean= -1.455706e-006 m
DeltaL PV= 1.114100e-006 m over 30 sec
DeltaL rms= 2.190364e-007 m
Status Not OK: 0

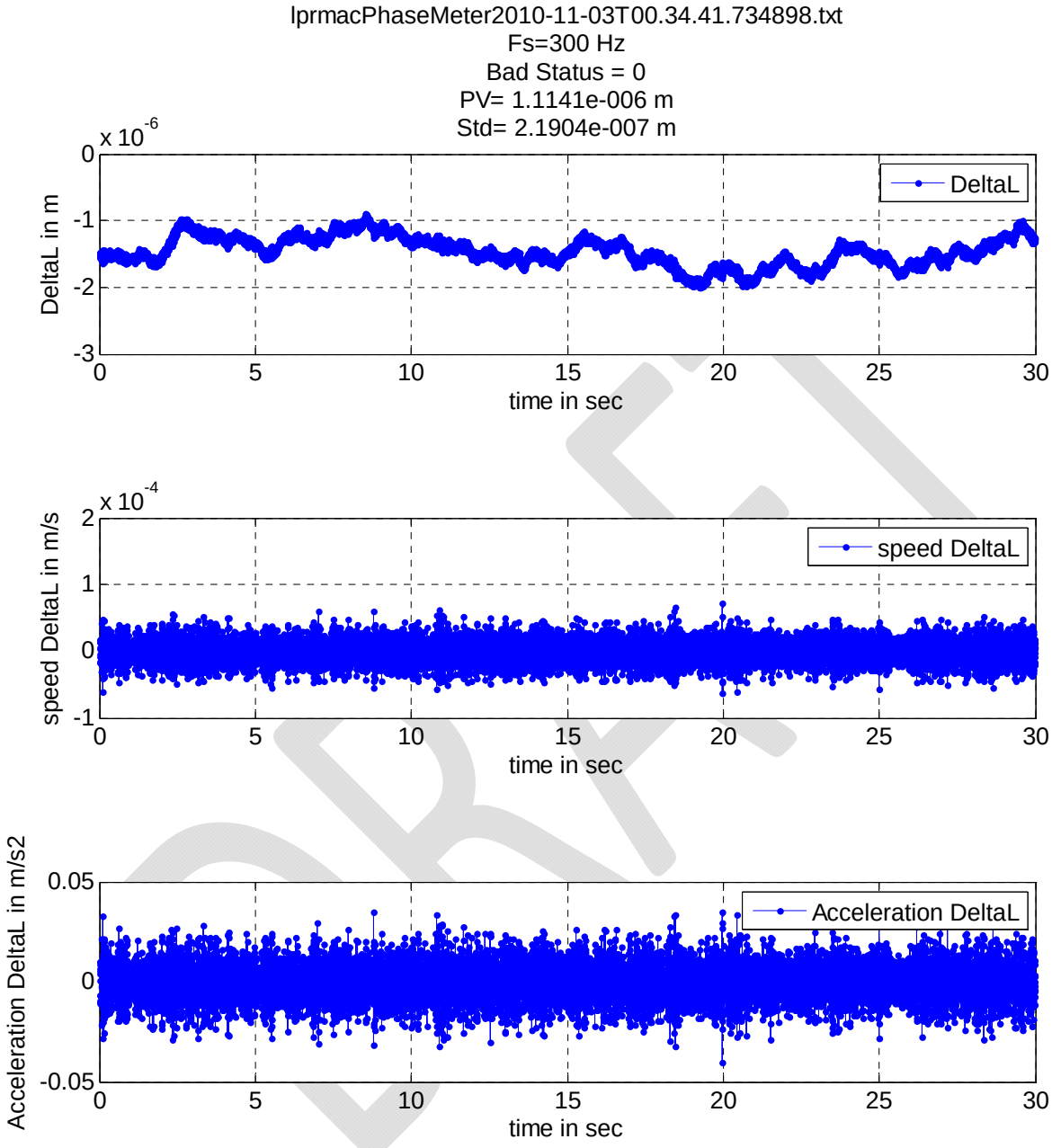
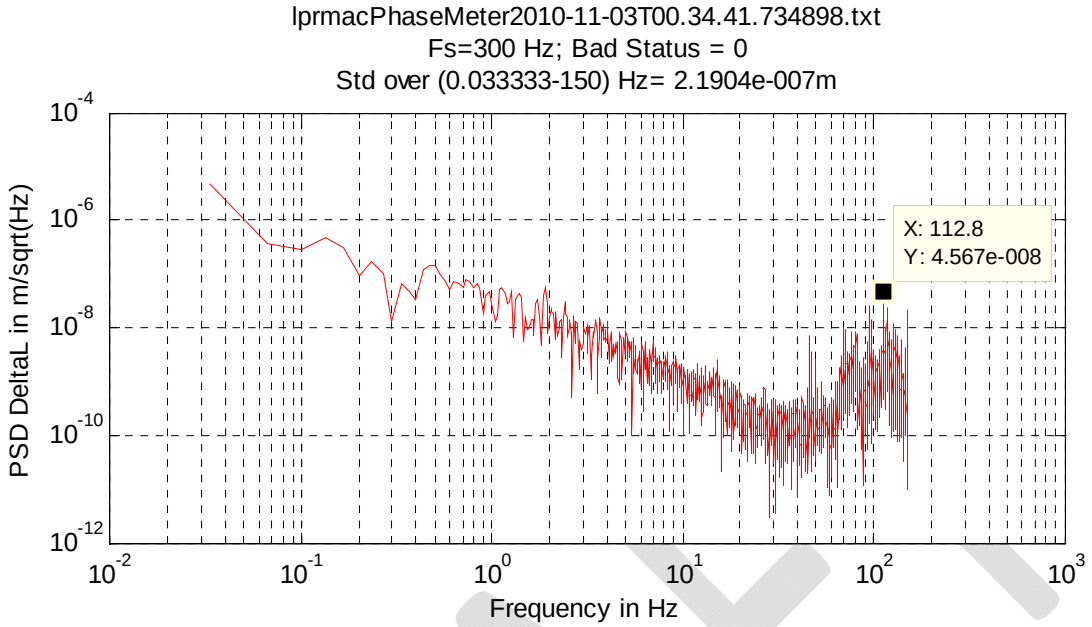
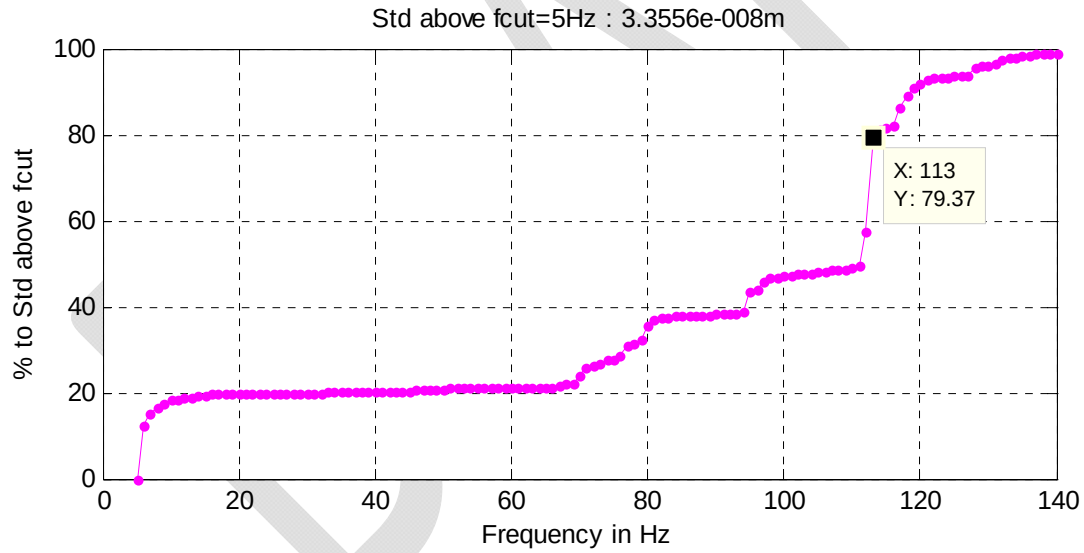


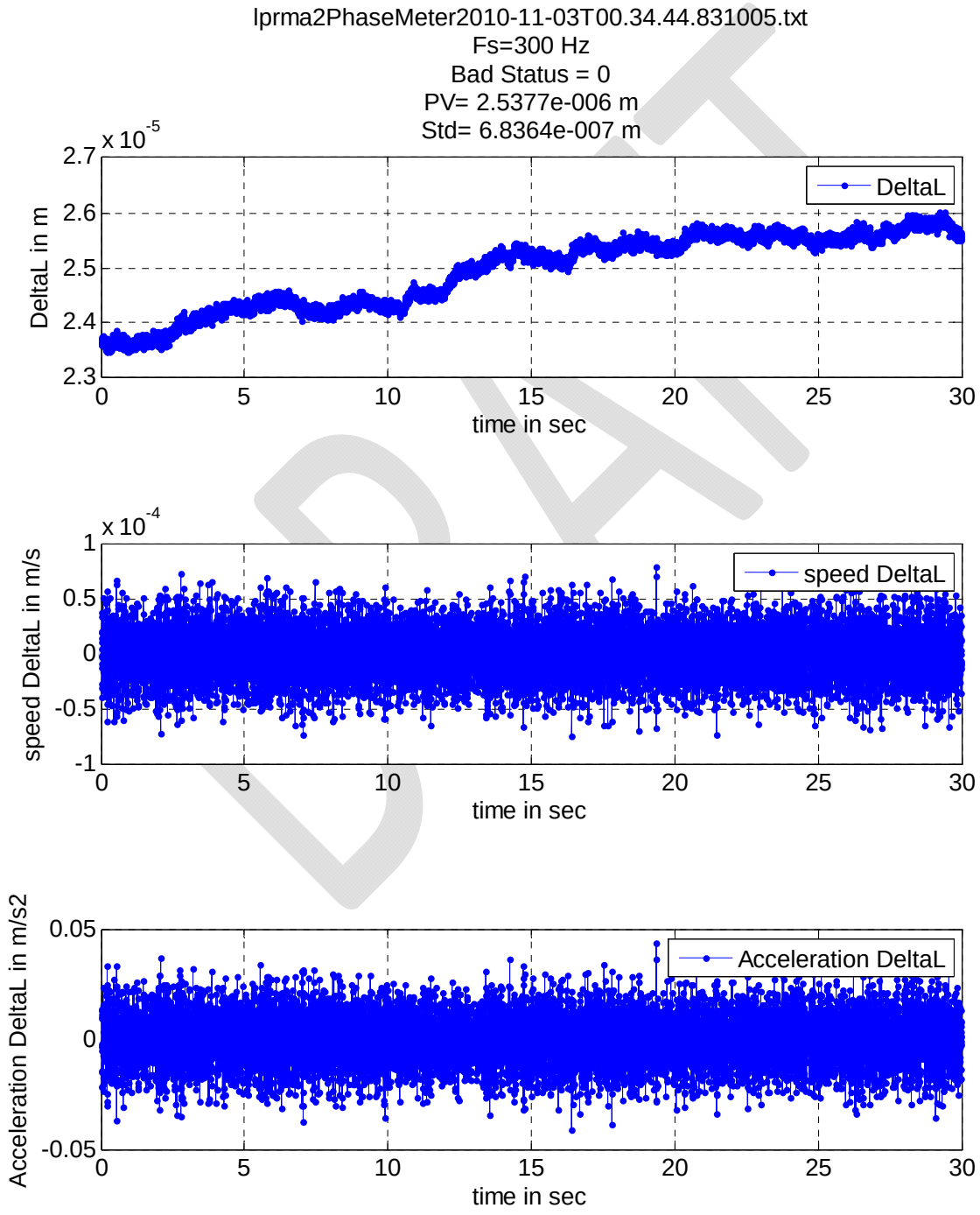
Figure 1: lprmacPhaseMeter2010-11-03T00.34.41.734898.txt.
DL2&4=14m and DDL=0 ; all DL and DDL fixed.
AT3-G2-DL2-IP1: OPL0=97m; AT4-J2-DL4-IP3:OPL0=158m leading to Internal OPD~61m
Telescope Opened

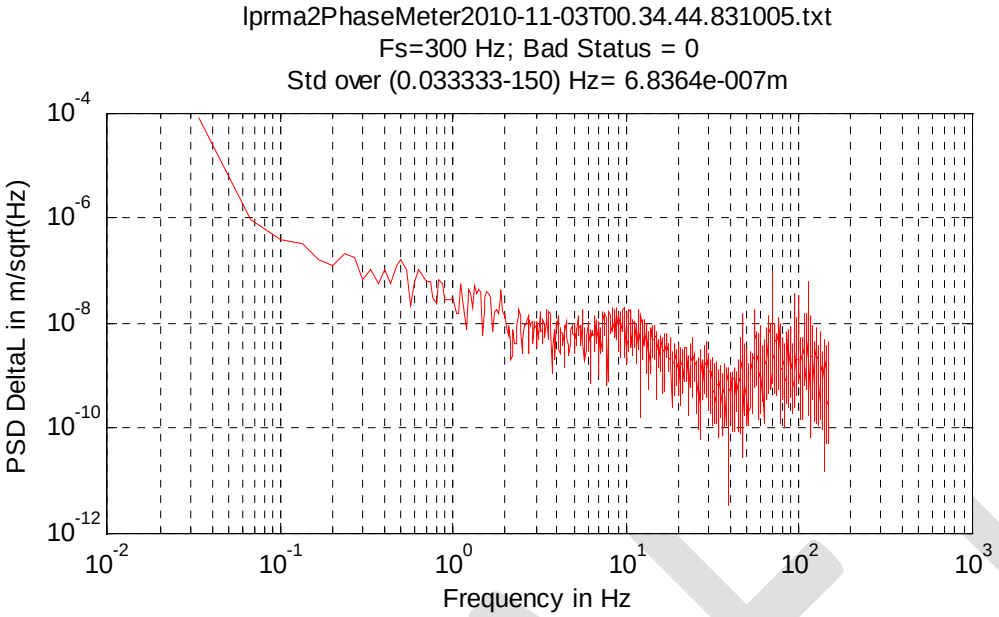

lprmacPhaseMeter2010-11-03T00.34.41.734898.txt
Fs=300 Hz; Bad Status = 0
Std over (0.033333-150) Hz= 2.1904e-007m
PSD DeltaL in m/sqrt(Hz)
Frequency in Hz
X: 112.8
Y: 4.567e-008

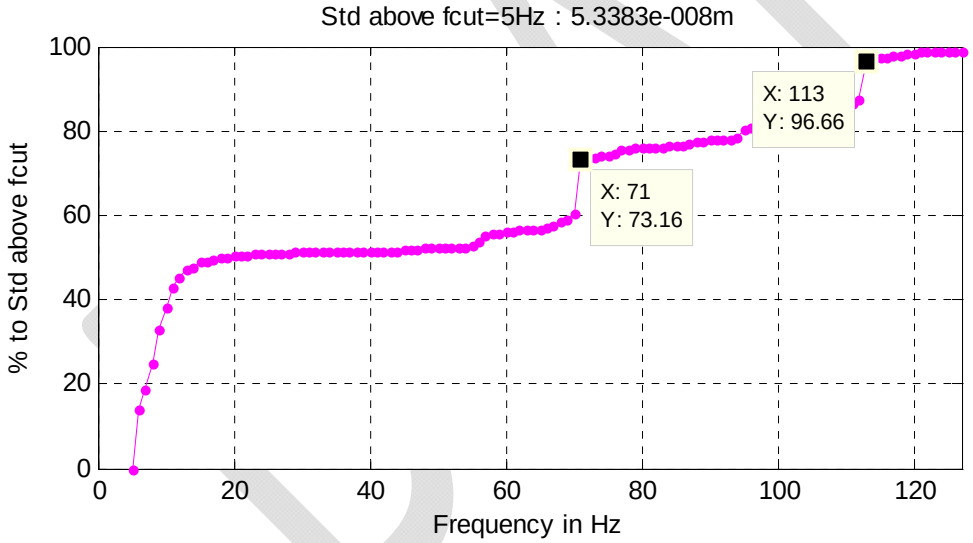

Std above fcut=5Hz : 3.3556e-008m
% to Std above fcut
Frequency in Hz
X: 113
Y: 79.37

==> Filename: lprma2PhaseMeter2010-11-03T00.34.44.831005.txt

Sampling frequency= 300 Hz
Number of samples= 9000
DeltaL Mean= 2.493808e-005 m
DeltaL PV= 2.537700e-006 m
DeltaL rms= 6.836381e-007 m
Status Not OK: 0




lprma2PhaseMeter2010-11-03T00.34.44.831005.txt
Fs=300 Hz; Bad Status = 0
Std over (0.033333-150) Hz= 6.8364e-007m
PSD DeltaL in m/sqrt(Hz)
Frequency in Hz


Std above fcut=5Hz : 5.3383e-008m
% to Std above fcut
Frequency in Hz
X: 113
Y: 96.66
X: 71
Y: 73.16

6 WED 3/11/10

6.1 Day-time Preparation of PRIMET

- Check Marcel with sighting scopes: OK no realignment necessary
- Calibration of FSU's ACU Autotest positions using Marcel
- Measurement of the quadcell open loop TF for gain optimization
- Operate PRIMET dltestTrack ldl4 14 19; looks OK at least up 50 m, then pupil tacking lost from time to time
- After VLTI start-up, and telescope opened DL2/4 fixed at 14m
    - * IP1 TRA=5.6 PGA=1 SUM=2.2V AT3_VCMA db values + offset (0.1;0)
    - * IP2 TRA=1 PGA=100 SUM=4.7V AT3_VCMB db values + offset (-0.15;-0.1)
    - * IP3 TRA=5.6 PGA=1 SUM=3.15V AT4_VCMA db values + offset (-0.2;0.3)
    - * IP4 TRA=1PGA=100 SUM=8.5V AT4_VCMB db values + offset (-0.15;0.25)

6.2 Check the impact of the new low pass filter located above on STRAP

- Characterize mag limit for field stab and iris guiding with strap low pass filter and residual PRIMET straylight:
    - Vmag=11 for field stabilization
    - lab-guiding tested up to Kmag=7.7~Hmag (DIT=0.5 sec)

6.3 Test the compatibility of PRIMET with Dark/Flat calibration using the ACU

- Test compatibility of PRIMET with Dark/Flat calibration using the ACU with uncontrolled direction/controlled amplitude-> **NOK** (scenario: All TTP out, TTP2's out,TTP1's out)
    - sky calibration template fails with ACU offpos of 200microrad on both axes, even if it is sliced in 8 steps of 25 microrad with ~2 seconds waiting times. An ACU offset of 200 microrad on both axiscorresponds to a radial offset of 283microad= 7.8 pixels on IRIS or 1.13 arcsec_sky
    - sky calibration template successful with ACU offpos of 50microrad on both axes...but these offsets not large enough in practice
    - need to develop alternative which does not involve PRIMET (since it is not needed) or using actuators not affecting PRIMET

6.4 Compatibility of the PRIMET pupil tracking point and stellar pupil position and shape:

- OK, Pupil tracking on Ip4 (VCMB=28.8; 16.5). This position is very good for stellar pupil as seen on ARAL.
- Difference ACU position between AUTOTEST and SCIENTIFIC < 70 microrad (<2 pix on IRIS)

6.5 ACU Autotest/scientific Reference values

wed 3/11
FSUB AUTOTEST (savepos)
B TTP1(IP2) X=-237.4 (-235.9) microrad ; Y=117.6 (115.5) microrad
B TTP2(IP4) X=11.73 (10.70) microrad ;Y=225.5 (223.9) microrad
(...): values obtained on 2/11
KWSUM~70000ADU

FSUA AUTOTEST (savpos)
A TTP1(IP1) X= -62.74 (-66.58) microrad ; Y=-8.237 (3.9) microrad
A TTP2(IP3) X= -656.2 (-643.9)microrad ;Y= 505.9 (512) microrad
(...): are values from 1/11
KWSUM~86000 ADU

FSUA Scientific (savpos)
A TTP1(IP1) X= -46 (-62.74)microrad ; Y=-0.27 (8.24) microrad
A TTP2(IP3) X= -649 (-656.2) microrad ;Y= 509 (505.9) microrad
(...): are Autotest values
KWSUM~300ADU

FSUB Scientific (savepos)
B TTP1(IP2) X=-221 (-237.4) microrad ; Y=62 (117.6) microrad
B TTP2(IP4) X=-38 (11.73) microrad ;Y=198 (225.5) microrad
(...): are Autotest values
KWSUM~100 ADU

Difference AUTOTEST/SCIENTIFIC
FSUA Delta_TTP1(IP1)= 18 microrad
Delta_TTP2(IP3)= 8 microrad
Delta_R~20 microrad_mirror---> < 1 pix on IRIS

FSUB Delta_TTP1(IP2) X=57 microrad
Delta_TTP2(IP4) X=38 microrad
Delta_R~69 microrad_mirror---> < 2 pix IRIS

6.6 Compatibility Dual feed blind tracking and IRIS Guiding

Configuration:
Dual feed preset: HD10268 Primary V=7.4 Hmag=4.8 Secondary K=4.6 V=8.9 K=3.8
DL2=ref=47m DL4 blind tracking=24m going down
DDL: fixed…preset failed on DDL-> wrong configuration DDL fixed/tracking
Lab guiding started OK: DIT=0.05sec

First file: PRIMA Metrology is in Stable Recording with FSU ACU in AUTOTEST position
MetQuadCorrections2010-11-04T02.21.41.520019.txt
Recording time=100sec

IP1
Mean Q1 = 6.844763e-001 V
Mean Q2 = 5.614027e-001 V
Mean Q3 = 6.846995e-001 V
Mean Q4 = 5.601389e-001 V

R_Pk= 4.901662e-001 p R_rms= 1.462888e-002 p → Biased by peak at T~90 sec. Origin unknown.Otherwise OK (see below)

IP2

Mean Q1 = 7.564278e-001 V
Mean Q2 = 9.719946e-001 V
Mean Q3 = 7.557670e-001 V
Mean Q4 = 9.713625e-001 V
R-Pk= 1.302845e-001 p R_rms= 1.622638e-002 p

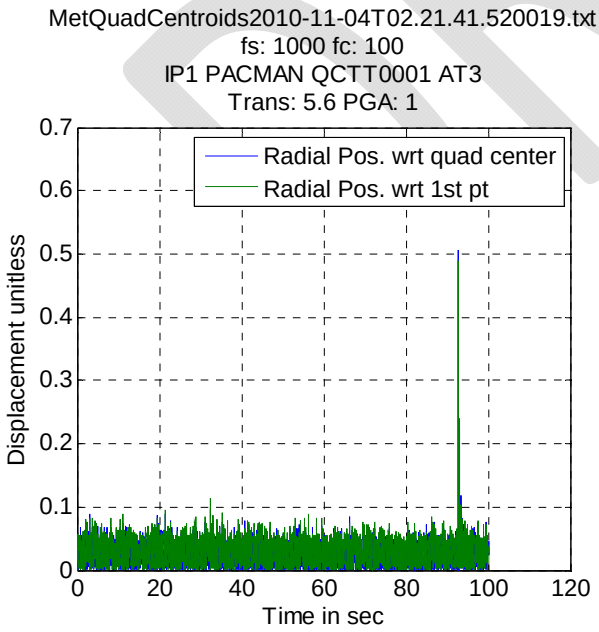
IP3:

Mean Q1 = 5.742588e-001 V
Mean Q2 = 7.416733e-001 V
Mean Q3 = 5.745435e-001 V
Mean Q4 = 7.414277e-001 V Mean Sum= 2.631903e+000 V
R_Pk= 1.188568e-001 p R_rms= 1.257262e-002 p

IP4:

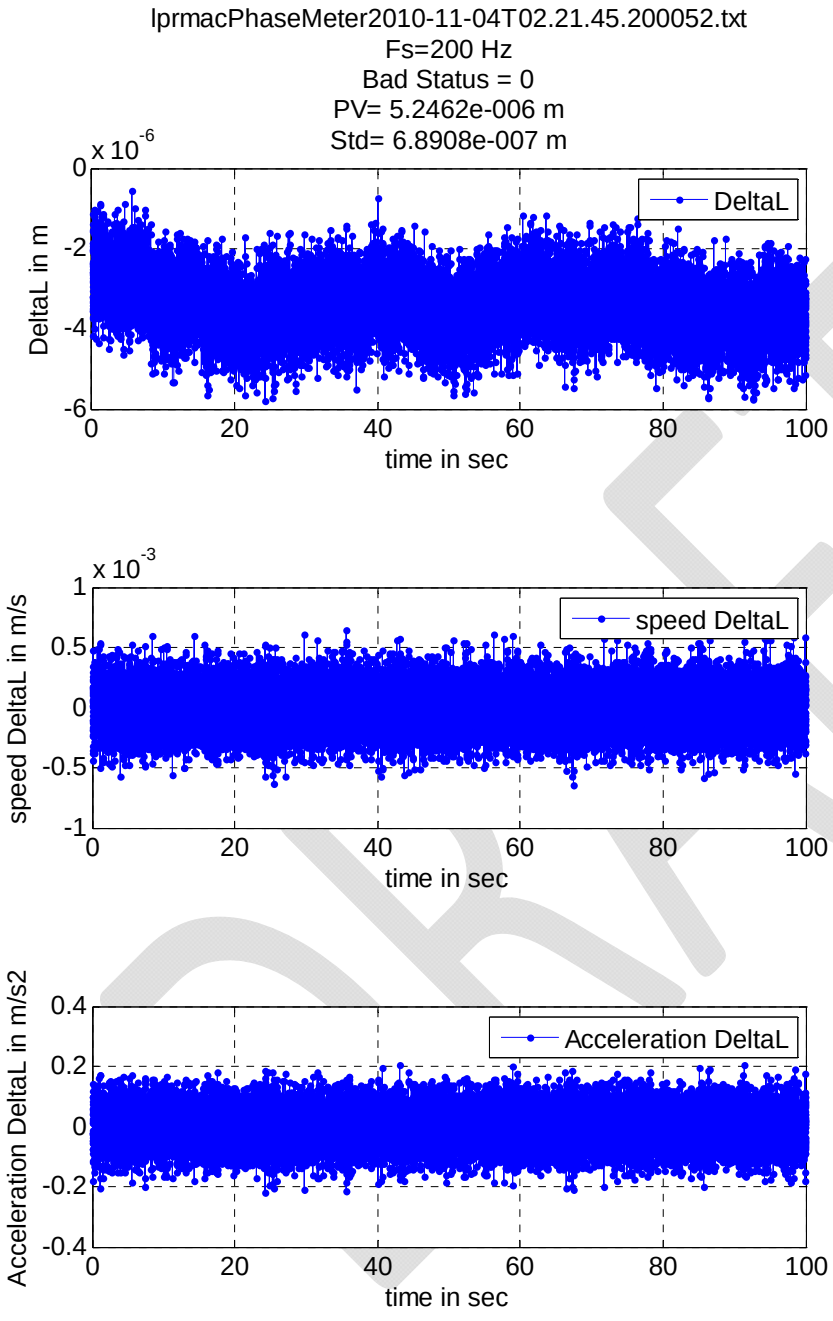
Mean Q1 = 2.182801e+000
Mean Q2 = 2.096407e+000 V
Mean Q3 = 2.183610e+000 V
Mean Q4 = 2.096018e+000 V
R_Pk= 1.467666e-001 p R_rms= 1.610941e-002 p

Event on IP1 not seen on other IP's



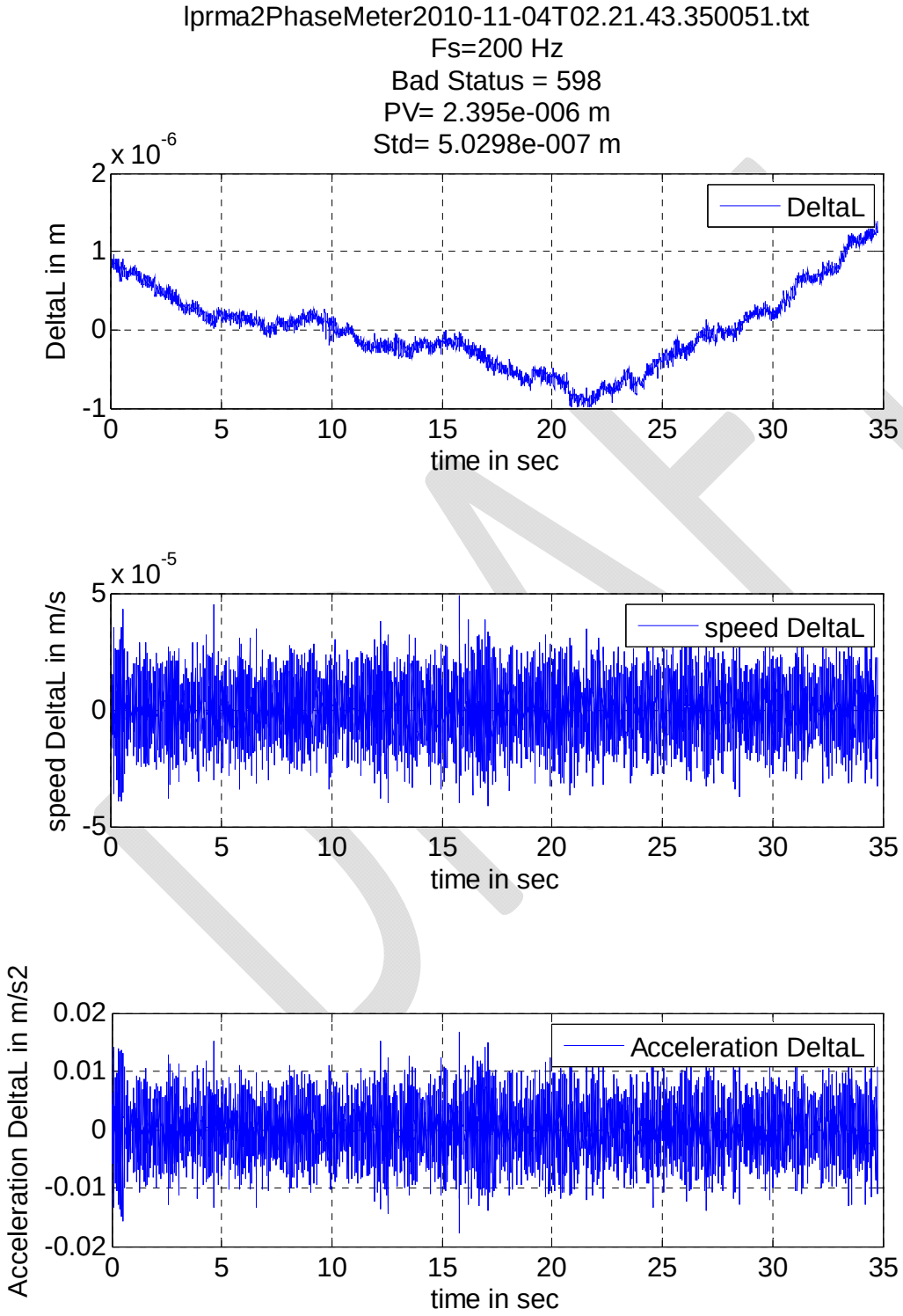
==> Filename: lprmacPhaseMeter2010-11-04T02.21.45.200052.txt

Sampling frequency= 200 Hz
Number of samples= 20000
DeltaL Mean= -3.401724e-006 m
DeltaL PV= 5.246200e-006 m
DeltaL rms= 6.890809e-007 m
Status Not OK: 0



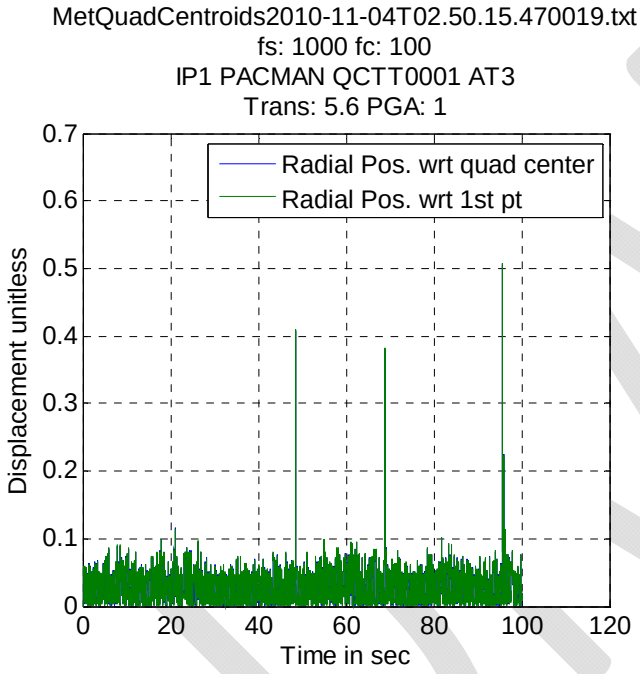
Phase Meter Data
==> Filename: lprma2PhaseMeter2010-11-04T02.21.43.350051.txt
Sampling frequency= 200 Hz
Number of samples= 20000

Detrend (DeltaL) before PM overflow



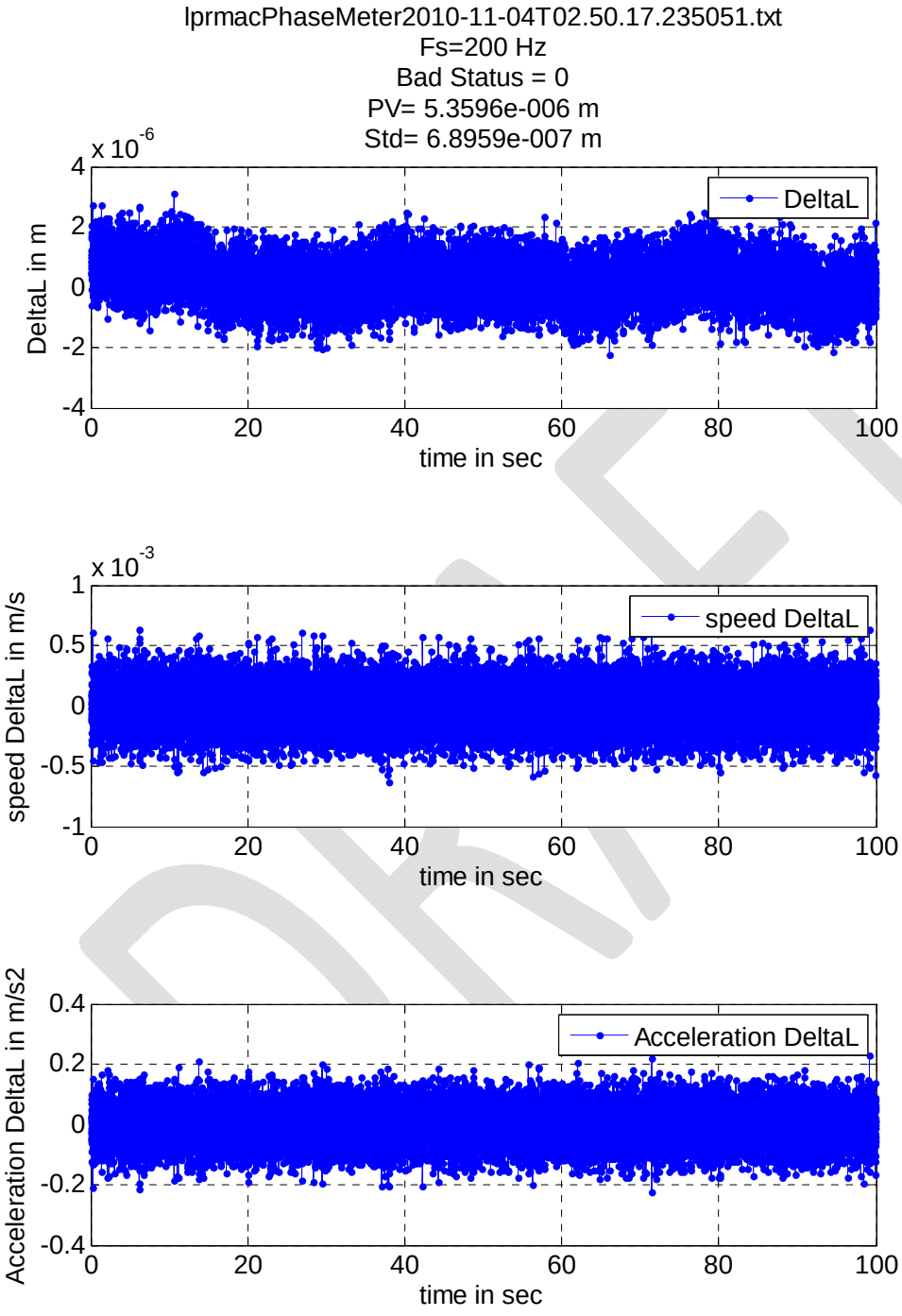
Represet delay lines necessary
DL2=64.2m
DL4=26.6 m going down
beam lost on IP2-AT3-FSUB.
do beam search and recenter it manually and close loop OK
go in stable_recording and record enginnering files:
UT=1h03
MetQuadCorrections2010-11-04T02.50.15.470019.txt
All IP's in specs except Events on IP1 not seen on other IP's

➔ Origin unkown: Motion of DDL 1??



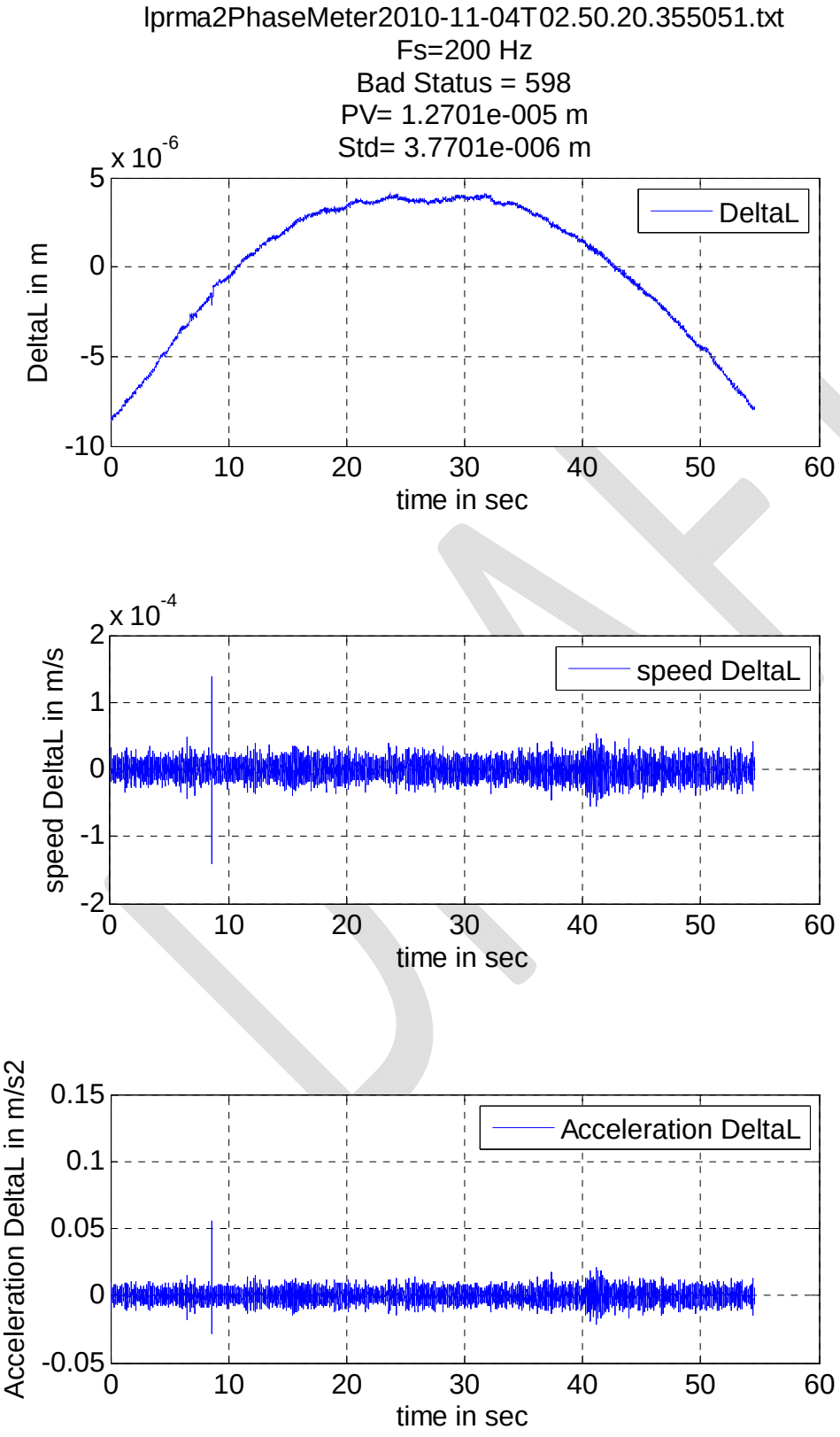
==> Filename: lprmacPhaseMeter2010-11-04T02.50.17.235051.txt

Sampling frequency= 200 Hz
Number of samples= 20000
DeltaL Mean= 2.427783e-007 m
DeltaL PV= 5.359600e-006 m
DeltaL rms= 6.895887e-007 m
Status Not OK: 0



DDL not blind tracking

==> Filename: lprma2PhaseMeter2010-11-04T02.50.20.355051.txt
Sampling frequency= 200 Hz
Number of samples= 20000
Detrend (DeltaL) before PM overflow


lprma2PhaseMeter2010-11-04T02.50.20.355051.txt
Fs=200 Hz
Bad Status = 598
PV= 1.2701e-005 m
Std= 3.7701e-006 m
x 10^-6
DeltaL in m
DeltaL
time in sec
x 10^-4
speed DeltaL in m/s
speed DeltaL
time in sec
Acceleration DeltaL in m/s2
Acceleration DeltaL
time in sec

Origin of parabolic shape after detrend ?: natural deviation of blind trajectory from straight line or more fishy ?
Not seen in previous file
15 microns drift in 30 sec compared to 2 microns in previous file

7 THU 4/11/10

7.1 Check impact of fsm alignment offsets on metrology robutness

Moving all FSM's horizontally away from the edge in the following order:

* lat4fsm beam B: W=-X-→ IP4
* lat4fsm beam A: W=+X→IP3
* lat3fsm beam B: W=-X→ IP2
* lat3fsm beam A: W=+X →IP1

Start from offset X=100 then go to X=700 , come back to X=100 and go finally to X=700.

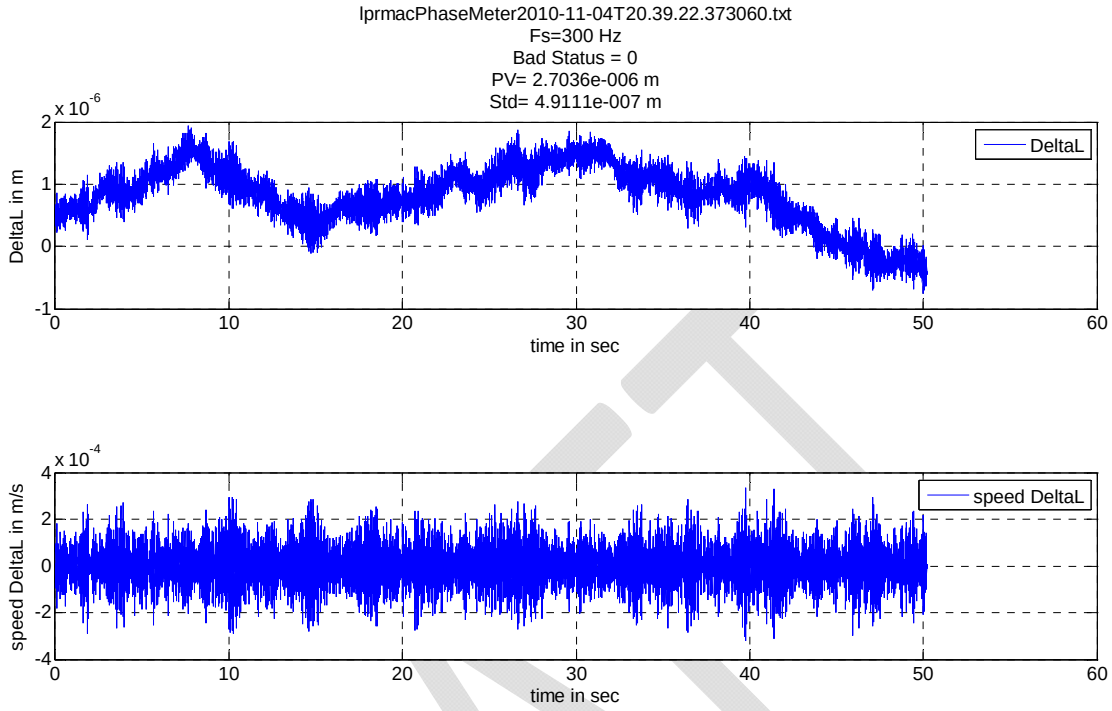
- → 3 transitions on each IP (but simultaneous on 2 IPs [IP4;IP3]=AT4 then [IP2;Ip1]=AT3
- → 6 transitions on DeltaL

Amplitude of the motion=600 units alignment offset=30 arcsec_sky !!
No problem. PRIMET remains in stable_recording.
Record file during the fsm offsets:

also get files on lprmac and lprma2

```
% Parameters of the controllers
% IP3 IM Gain A1 A2 B1 B2 1 0 0 -1 0.04 -0.875 0 -1 0
% IP1 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.02 -0.875 0 -1 0
% IP4 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.04 -0.875 0 -1 0
% IP2 IM Gain A1 A2 B1 B2 1 0 0 -1 0.02 -0.875 0 -1 0
```

-rw-rw-rw- 1 vx vlt 612264 Nov 4 20:40 MetQuadCorrections2010? -11-04T20.39.25.880019.txt
IP1:PV Rcorr= 1.463168e-001 R_Pk= 2.153475e-001 p
IP2: PV Rcorr= 1.143480e-001 R_ Pk= 2.190968e-001 p
IP3: PV Rcorr= 3.006326e-001 R_Pk= 1.394569e-001 p
IP4: PV Rcorr= 3.424904e-001 R_Pk= 2.051376e-001 p
-> Perfo not as good as day before; but no signature on fsm motion (within residuals)
Phase Meter Data
==> Filename: lprmacPhaseMeter2010-11-04T20.39.22.373060.txt
Sampling frequency= 300 Hz
Number of samples= 15066
DeltaL Mean= 8.150588e-007 m
DeltaL PV= 2.703600e-006 m
DeltaL rms= 4.911123e-007 m
Status Not OK: 0



-rw-rw-rw- 1 vx vlt 6848512 Nov 4 20:46 MetQuadCentroids2010? -11-04T20.42.06.890019.txt

IP1 R_Pk= 2.542844e-001 p
IP2: R_Pk= 4.641058e-001 p
IP3: R_Pk= 3.022849e-001 p
IP4: R_Pk= 4.118361e-001 p

- ➔ Signature of fsm motion clearly seen ! higher on IP2 and IP4
- ➔ Fsm W motion gives a cross talk in horizontal lateral displacement
- ➔ Estimate mismatch longitudinal position of pupil plane (error ffsm or quadcell postions)

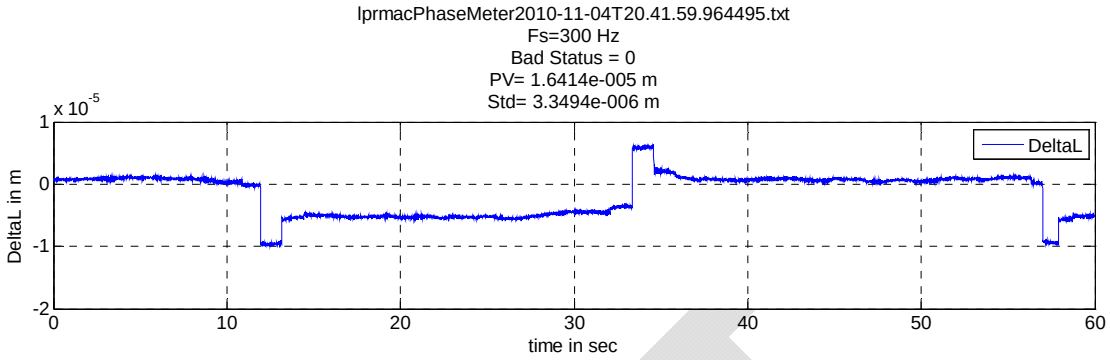
****

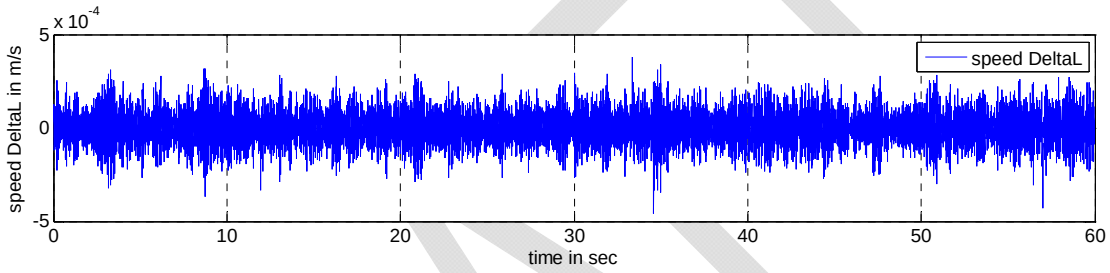
Phase Meter Data

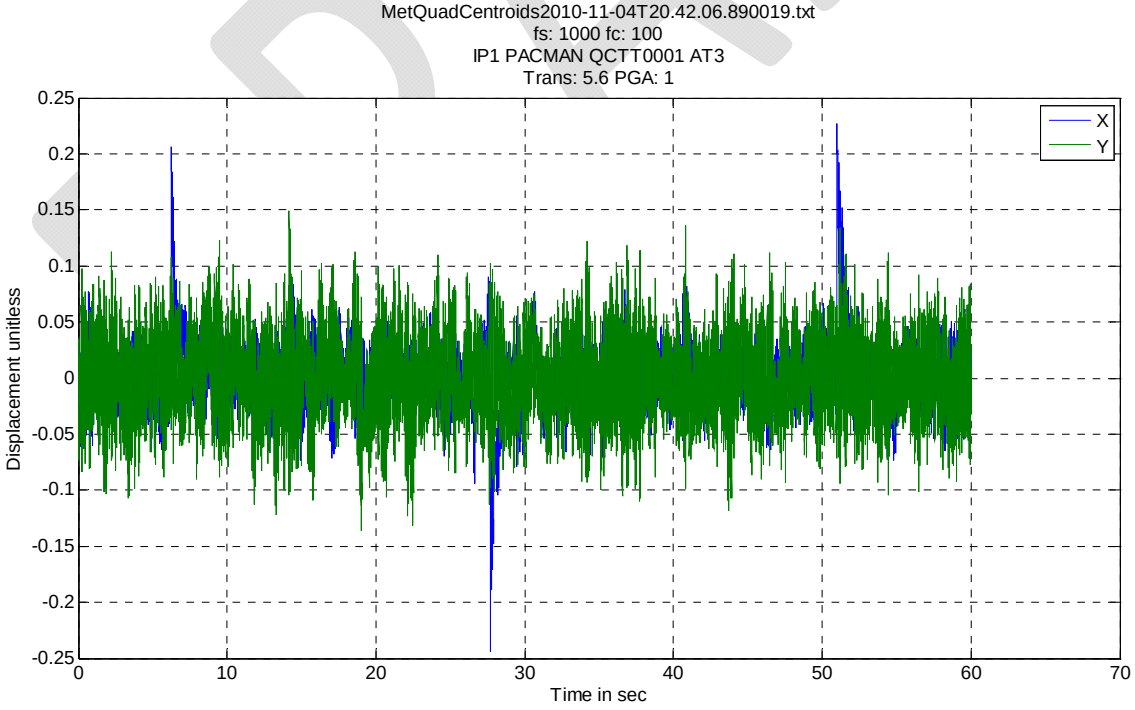
==> Filename: lprmacPhaseMeter2010-11-04T20.41.59.964495.txt

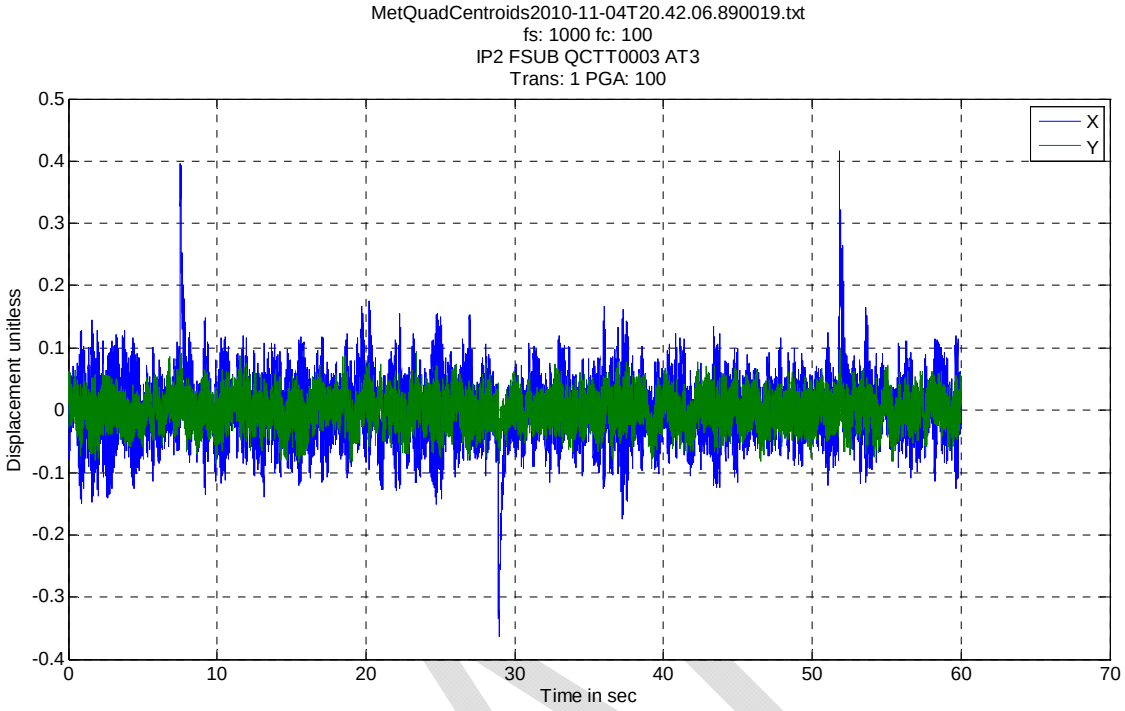
Sampling frequency= 300 Hz
Number of samples= 18000
DeltaL Mean= -1.654482e-006 m
DeltaL PV= 1.641380e-005 m
DeltaL rms= 3.349384e-006 m
Status Not OK: 0

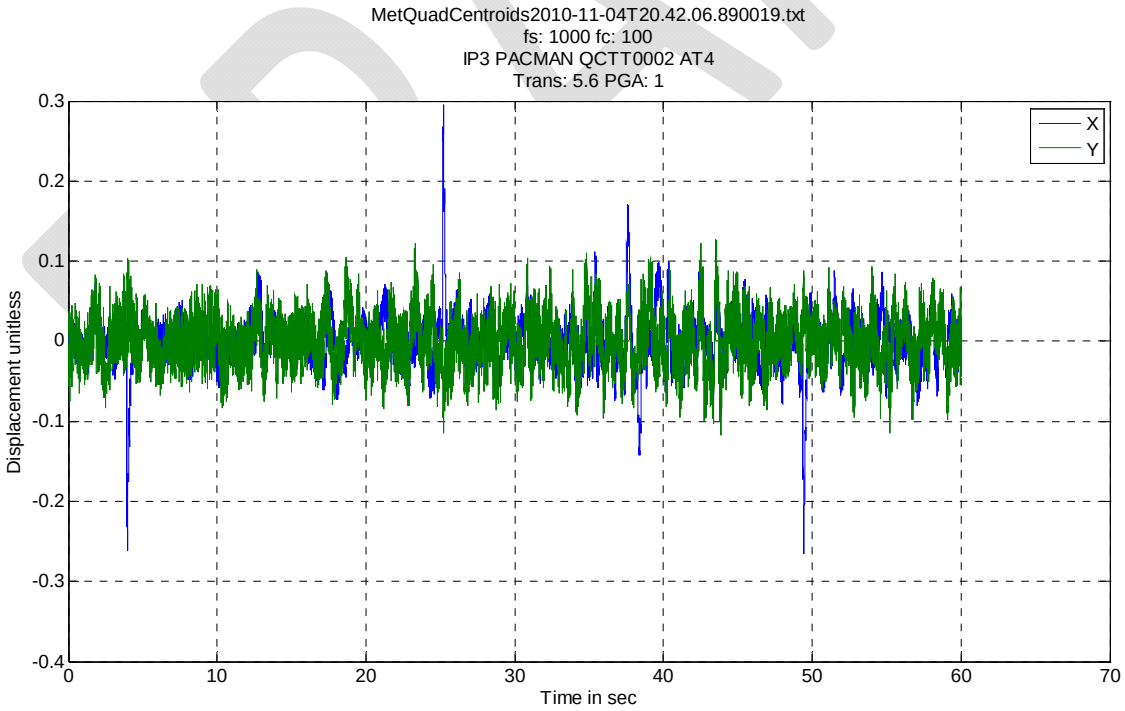
- ➔ 6 transitions as expected; when all fsms are equally moved by ΔW=600 (=30arcsec_sky)-> ΔDeltaL=5microns (see second transition on next figure). **The sensitivity is 167 nm/arcsec_sky** (to be compared to $S_{OPD/FSM}$=400nm/arcsec_sky ; COM3 on PRIMETB using 1 fsm only
- ➔ When the fsm are back to initial positions: no opd offset. Repeatability seems to be OK

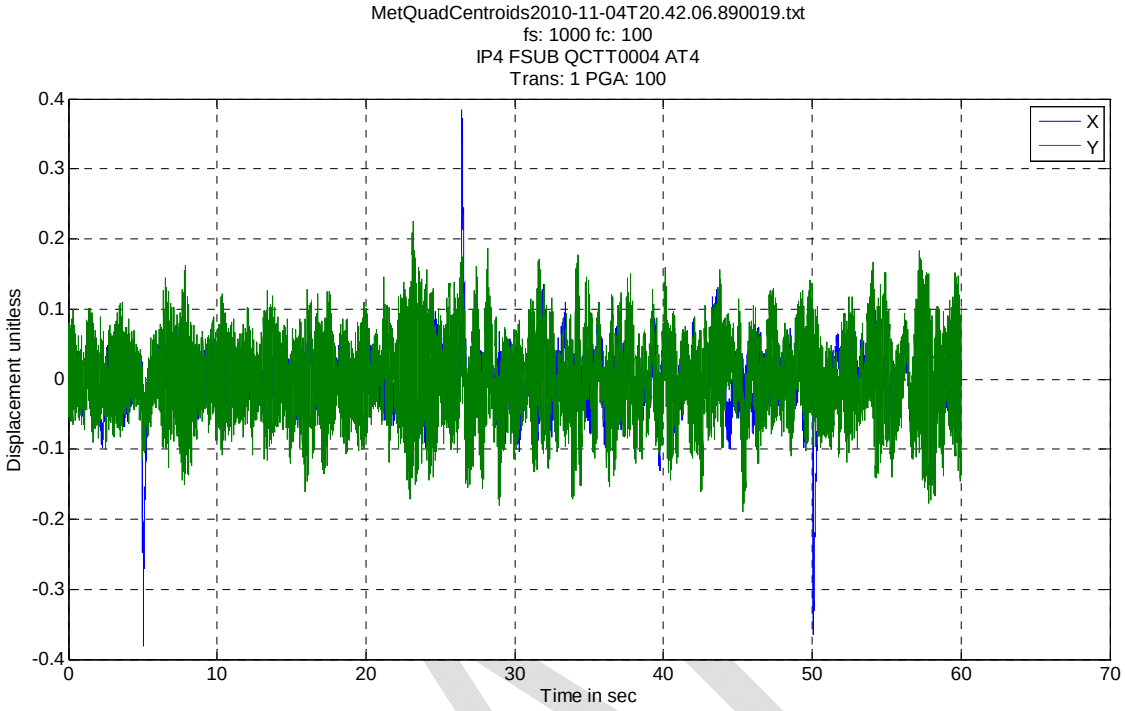

lprmacPhaseMeter2010-11-04T20.41.59.964495.txt
Fs=300 Hz
Bad Status = 0
PV= 1.6414e-005 m
Std= 3.3494e-006 m
x 10^-5
DeltaL in m
time in sec
DeltaL


x 10^-4
speed DeltaL in m/s
time in sec
speed DeltaL


MetQuadCentroids2010-11-04T20.42.06.890019.txt
fs: 1000 fc: 100
IP1 PACMAN QCTT0001 AT3
Trans: 5.6 PGA: 1
Displacement unitless
Time in sec
X
Y


MetQuadCentroids2010-11-04T20.42.06.890019.txt
fs: 1000 fc: 100
IP2 FSUB QCTT0003 AT3
Trans: 1 PGA: 100
X
Y
Displacement unitless
Time in sec


MetQuadCentroids2010-11-04T20.42.06.890019.txt
fs: 1000 fc: 100
IP3 PACMAN QCTT0002 AT4
Trans: 5.6 PGA: 1
X
Y
Displacement unitless
Time in sec



7.2 Check performance of pupil tracking on IP2 and IP4 with new control parameters

- ➔ DL fixed at 14m; DDL fixed at zero; enclosure closed; day-time (air conditioning on ?)
- ➔ Marginally better with new parameters on IP2 and IP4.

Parameters COM12

-rw-rw-rw- 1 vx vlt 7016881 Nov 4 22:09 MetQuadCentroids2010? -11-04T22.07.42.540020.txt

```
% Parameters of the controllers
% IP3 IM Gain A1 A2 B1 B2 1 0 0 -1 0.04 -0.875 0 -1 0—NOT ACTIVE
% IP1 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.02 -0.875 0 -1 0-NOT ACTIVE
% IP4 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.04 -0.875 0 -1 0→Pk= 3.833582e-002 p
% IP2 IM Gain A1 A2 B1 B2 1 0 0 -1 0.02 -0.875 0 -1 0 -> Pk= 1.331506e-001 p
```

New Parameters (derived by NDI)

-rw-rw-rw- 1 vx vlt 6296060 Nov 4 22:24 MetQuadCentroids2010? -11-04T22.19.58.749018.txt

```
% Parameters of the controllers
% IP3 IM Gain A1 A2 B1 B2 1 0 0 -1 0.04 -0.875 0 -1 0   → UNCHANGED; NOT ACTIVE
% IP1 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.02 -0.875 0 -1 0  → UNCHANGED; NOT ACTIVE
% IP4 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.03 -0.6667 0 -1 0  -> NEW; Pk= 3.808027e-002 p
% IP2 IM Gain A1 A2 B1 B2 1 0 0 -1 0.03 -0.6667 0 -1 0.. -> NEW; Pk= 9.104977e-002 p
```

7.3 Assess Impact of BTK on FSUB only

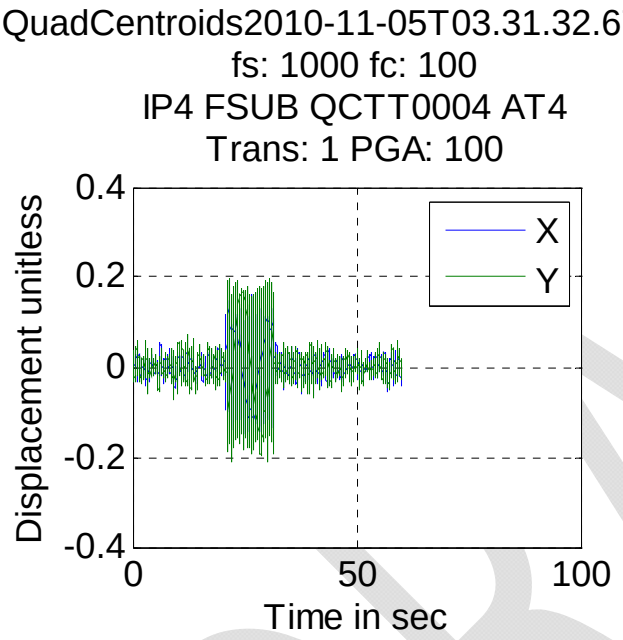
Pupil tracking in close loop

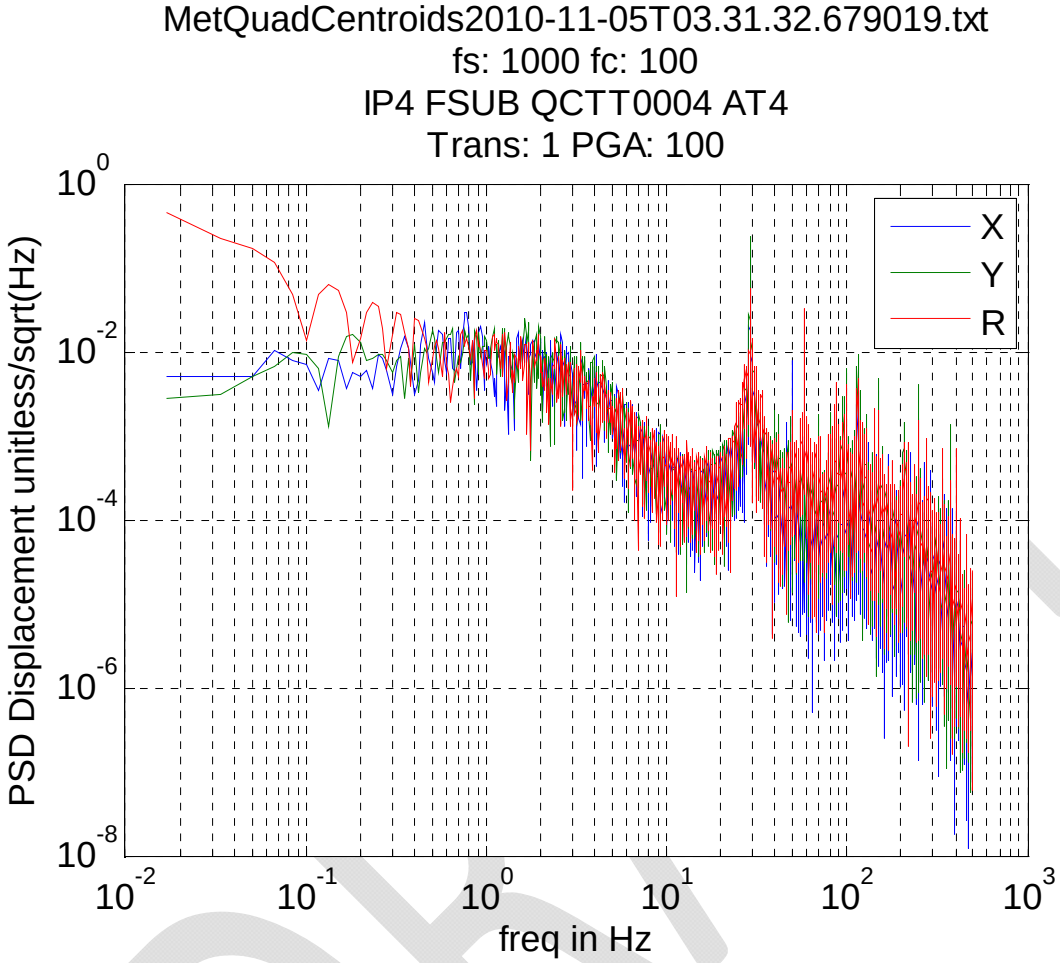
rw-rw-rw- 1 vx vlt 11175928 Nov 5 03:33 MetQuadCentroids2010? -11-05T03.31.32.679019.txt

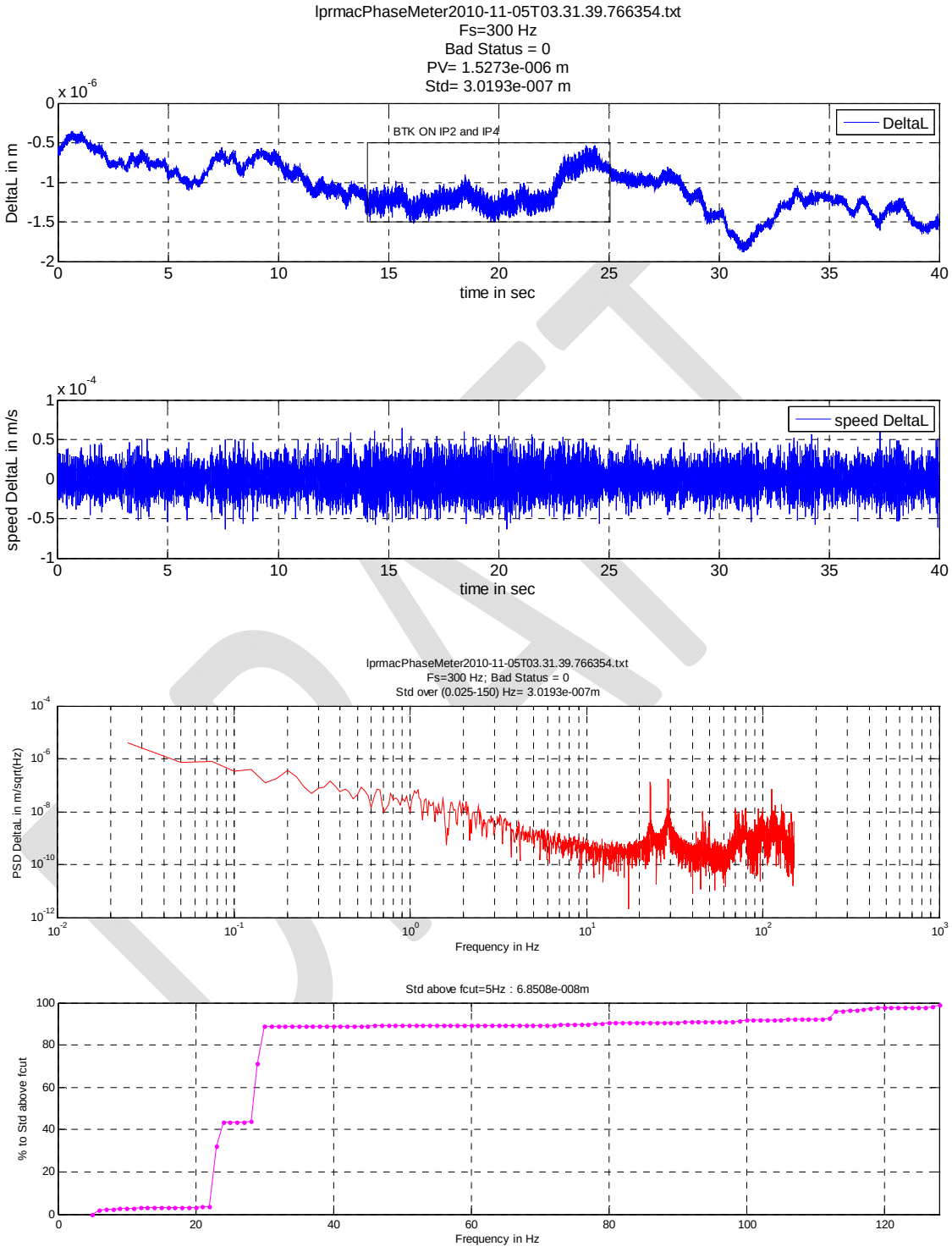
use IP2 and Ip4 only
IP4: Pk= **2.45e-001 p** (amplitude given by region of BTK)
IP2: same behavior; Pk= **2.07e-001 p**

lprma2PhaseMeter2010-11-05T03.31.35.605051

Eigen frequency introduced by BTK: ~30 Hz, not corrected by pupil tracking loop (BP~1-2 Hz only)
Impact on OPD: OPD oscillations (2 eigenfrequencies at 23 Hz and 29 Hz) total amplitude **~ 300nmPV**
No impact seen on "Fringe" files (sampling only 1 Hz…)




MetQuadCentroids2010-11-05T03.31.32.679019.txt
fs: 1000 fc: 100
IP4 FSUB QCTT0004 AT4
Trans: 1 PGA: 100
PSD Displacement unitless/sqrt(Hz)
freq in Hz
X
Y
R
10^0
10^-2
10^-4
10^-6
10^-8
10^-2
10^-1
10^0
10^1
10^2
10^3


lprmacPhaseMeter2010-11-05T03.31.39.766354.txt
Fs=300 Hz
Bad Status = 0
PV= 1.5273e-006 m
Std= 3.0193e-007 m
x 10^-6
DeltaL in m
BTK ON IP2 and IP4
DeltaL
time in sec
x 10^-4
speed DeltaL in m/s
speed DeltaL
time in sec
lprmacPhaseMeter2010-11-05T03.31.39.766354.txt
Fs=300 Hz; Bad Status = 0
Std over (0.025-150) Hz= 3.0193e-007m
PSD DeltaL in m/sqrt(Hz)
Frequency in Hz
Std above fcut=5Hz : 6.8508e-008m
% to Std above fcut
Frequency in Hz

7.4 Assess Impact of IFG

Run IFG sequence:

* IFG Off
* IFG On on IP2
* IFG On on IP4
* IFG Off on IP4
* IFGOff on IP2

Check actuation frequency of IFG ?=DIT of IRIS ?

-rw-rw-rw- 1 vx vlt 7965258 Nov 5 03:36 MetQuadCentroids2010? -11-05T03.35.20.809018.txt

IP2: R_Pk= 3.601469e-001 p

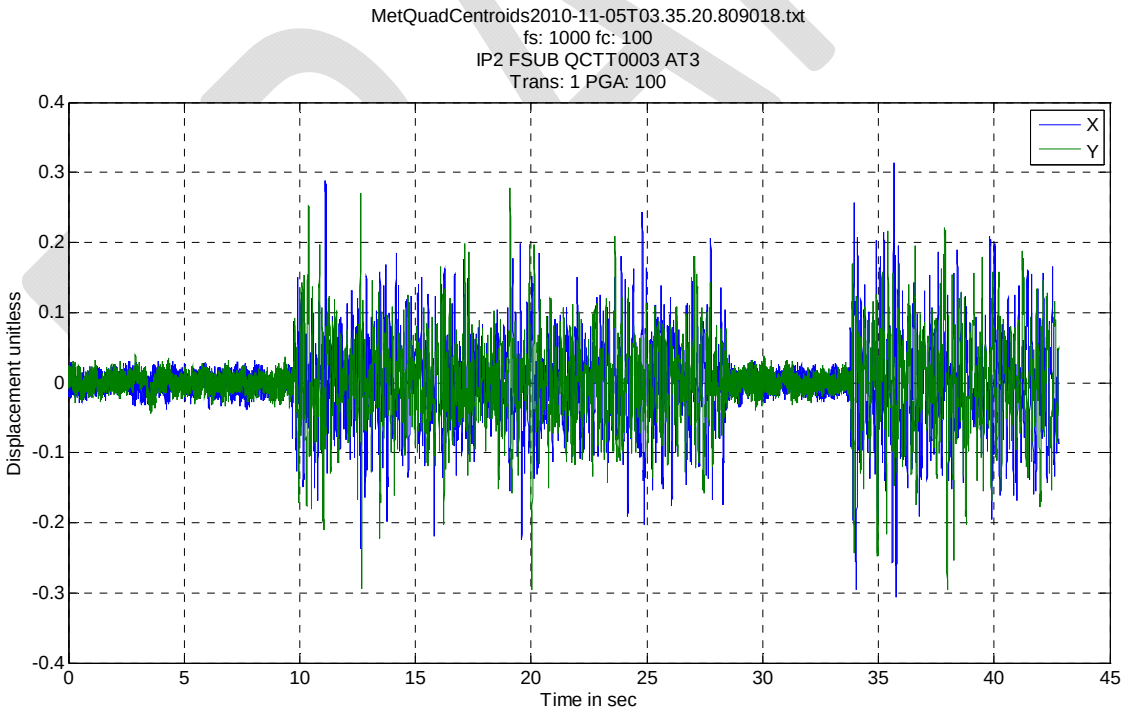
IP4: P_Pk= 4.568625e-001 p

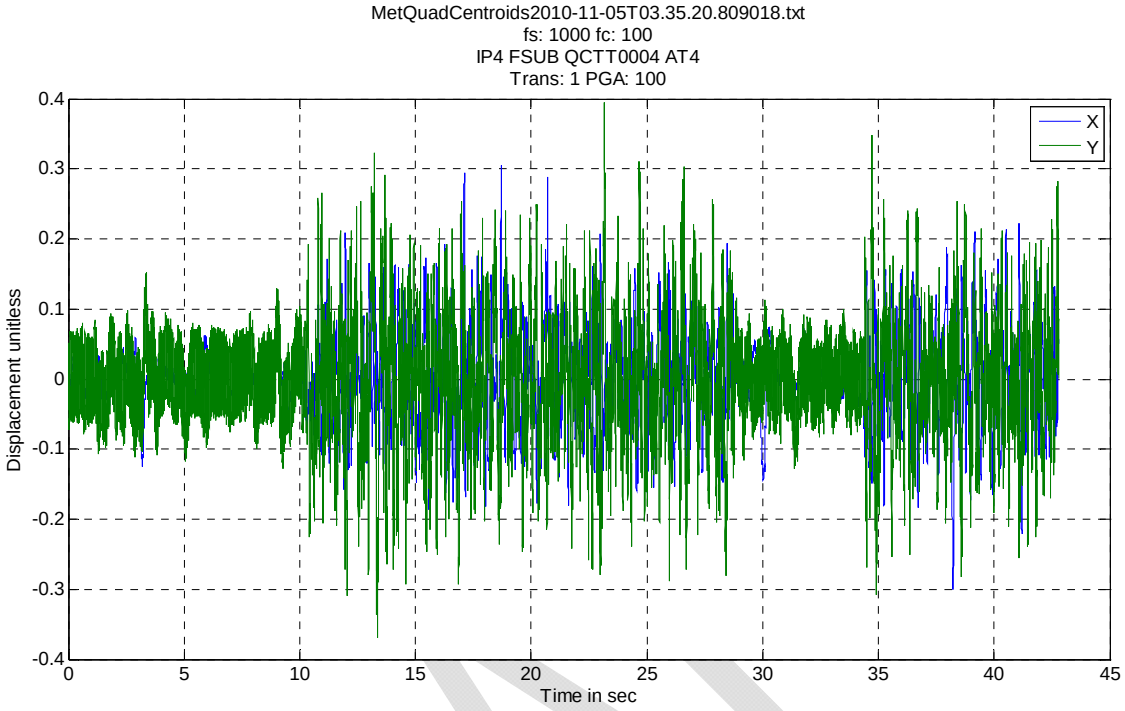
lprma2PhaseMeter2010-11-05T03.35.13.985051

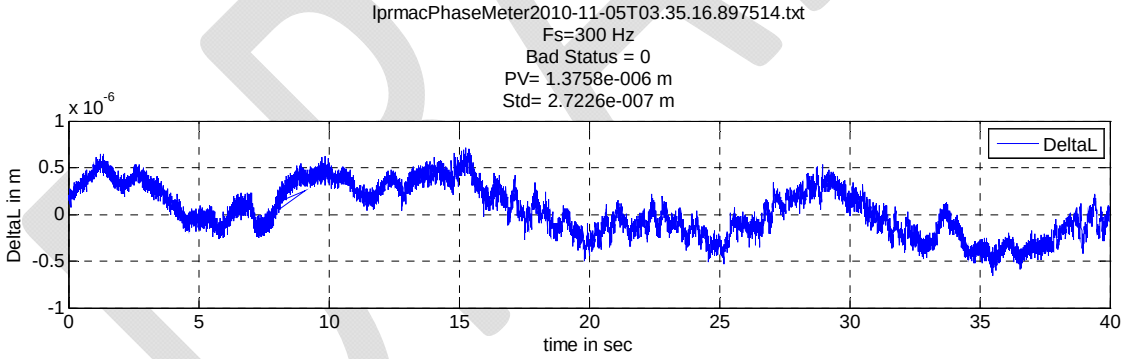
Fs=300Hz

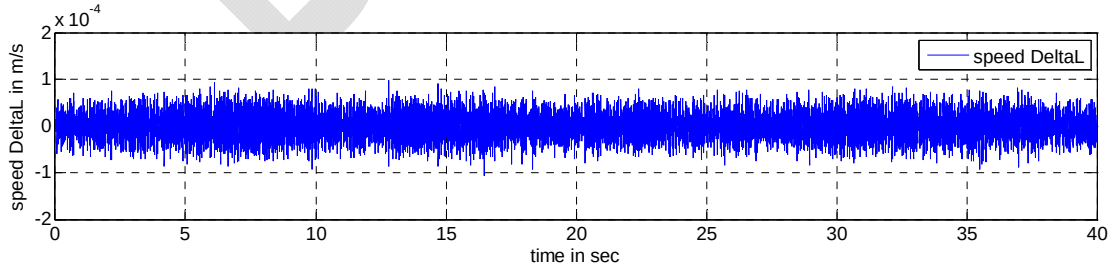
marginal effect on OPD...although quadcell residuals are much higher that effect of under sampling ?

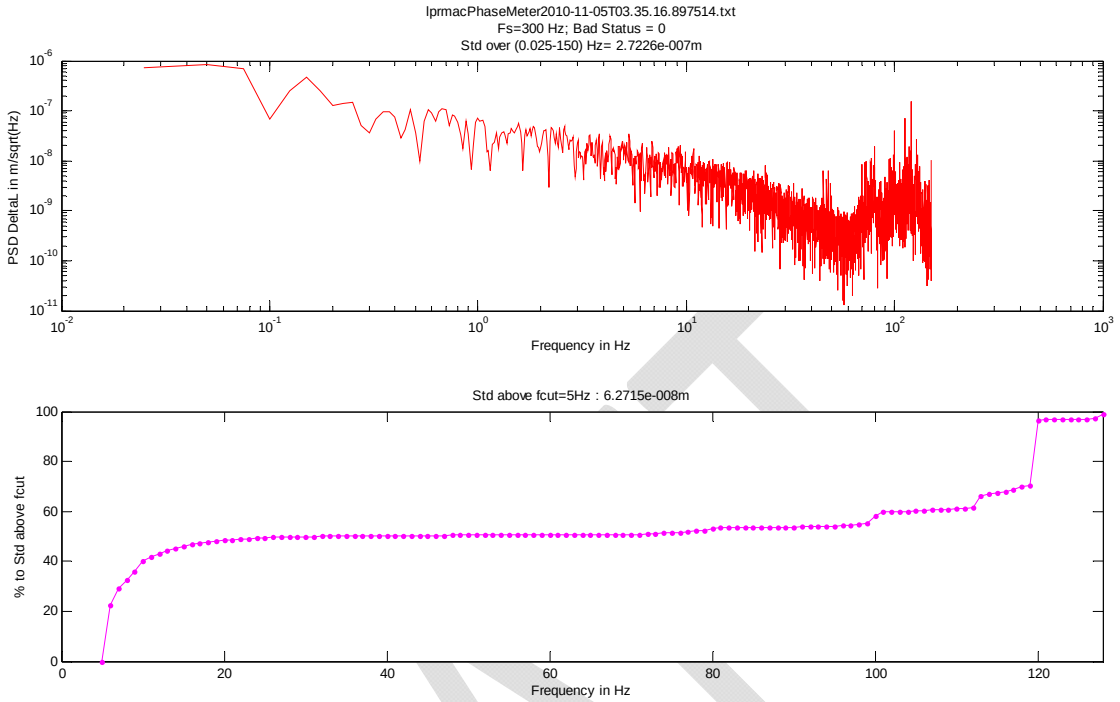
IFG: correction of residual atmos+internal turbulence → "pink noise" (no eigen-frequency as for BTK)




MetQuadCentroids2010-11-05T03.35.20.809018.txt
fs: 1000 fc: 100
IP4 FSUB QCTT0004 AT4
Trans: 1 PGA: 100
X
Y
Displacement unitless
Time in sec


lprmacPhaseMeter2010-11-05T03.35.16.897514.txt
Fs=300 Hz
Bad Status = 0
PV= 1.3758e-006 m
Std= 2.7226e-007 m
x 10^-6
DeltaL
DeltaL in m
time in sec


x 10^-4
speed DeltaL
speed DeltaL in m/s
time in sec


lprmacPhaseMeter2010-11-05T03.35.16.897514.txt
Fs=300 Hz; Bad Status = 0
Std over (0.025-150) Hz= 2.7226e-007m
PSD DeltaL in m/sqrt(Hz)
Frequency in Hz
Std above fcut=5Hz : 6.2715e-008m
% to Std above fcut
Frequency in Hz

8 FRIDAY 5/11/10

8.1 Osf PRIMET_PREPARE_STS

This script is the equivalent of PRIMET_PREPARE_MARCEL
See details in section 14

8.2 Definition of the PACMAN Instrument pointing offsets

See logs for details

Objective: Define the position of Marcel on IRIS as reference pixels for IRIS guiding.
Define PACMAN Instrument Pointing offsets accordingly.
This allows to have the FSU ACU positions "SCIENTIFIC" identical to "AUTOTEST" and therefore Maintain the PRIMET alignment valid for sky positions.

Background:

Experience shows that the co-alignment of FSU and IRIS drifts from 1 day to another. So even if we guide on 64,64 (or 64,52) with (fainter) double object, it doesn't mean that the FSU injection will be optimum with the predefined scientific position. The risk is that the spiral search and BTK on faint object lead to non-optimum injection (optimum found on secondary peak) and then does not recover.
The calibration of the ACU must always be done on bright object.
In order to avoid this step during the night , it was proposed to follow a procedure similary to the Amber case: a flux injection calibration is done during day-time with the beacon using the guiding ref is (64,52) where the nasmyth beacon can be put using the fsm.

New proposal: redefine IRIS ref pixel using the positions of Marcel in AUTOTEST.
Then only need to cross check marcel on IRIS and update if necessary the ref.pixel.
The definition of 64,64 is indeed arbitrary because there is no garanty that (64;64) or (64;52) is the center of the AT field

Procedure

Check Positions of Marcel on IRIS:
Filter H, IFO dichroics,IFOA mirror

IP	Q	Beam	Instrument Pointing Offset (PACMAN)	[pacmanPoffs->pofTable]
IP3	Q1 (62.53;52.04)	2	(-170.14 ;-25.73)	table line 2
IP1	Q2 (64.62;52.74)	1	(-161.26;4.37)	table line 1
IP4	Q3 (62.55;62.70)	2S	(-17.98;-21.21)	table line 7
IP2	Q4 (64.46;62.98)	1S	(-14.74;6.16)	table line 6
				all other table line=0

How to define manually the new IRIS reference pixel for PACMAN:

* ISS Observer Main->Align->MORE

* Need to update the Instrument Pointing Offsets
* [on wvgvlti select instrument: msgSend " " issifControlSELINS "PACMAN"]
* Go to Instrument Offset Computation: enter for each beam the correct IRIS ref. coordinate (CALCULATE and APPLY)
* select PACMAN as instrument: on wvgvlti --> msgSend " " issifControlSELINS "PACMAN"
(The ref pixels are sent to IRIS only after a SELINS. This command is sent as part of the VLTI start-up (see VLTI start-up from left click menu)
The instrument is NOT defined by (ISS) ARRAY CONFIGURATION:Expert Mode->feed Mode=PRIMA_DUAL-> Configure
or by ISS Observer Main: lab-> Mirror Configuration=PACMAN (no switchyard config) ->Configure

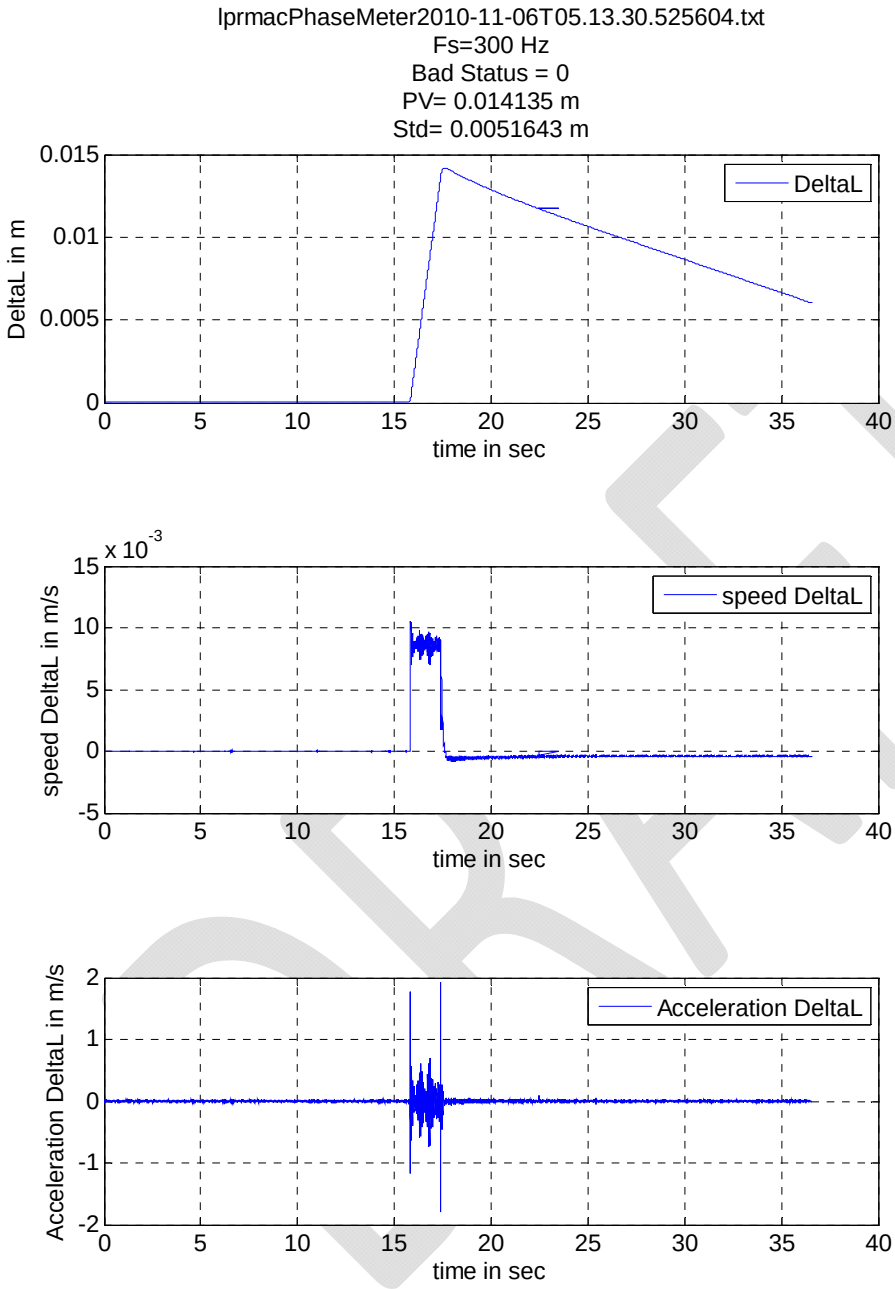
How to store the new IRIS reference pixel for PACMAN in the dB:

* ccseiDb ->wvgvlti--> :Appl_data:VLTI:isscfg:data:instrumentConfig:pacmanPoffs-->pofTable
* These values are not archived. Only valid until an image of the DB saved previously is loaded or until a reinstallation of ISS with its archived configuration

8.3 Impact of dOPDc offsets

Simple scan of DDL1 amplitude=0.01 period=200 (added to blind trajectory)
DL4=blind tracking also
Need to look at lprmac data: lprma2 works on ip2 and ip4 and does not see DDL1

7mm "mechanical" offset and simple fringe scan: **ΔOPL=14mm**
lprmacPhaseMeter2010-11-06T05.13.30.525604OK,
****
Phase Meter Data
==> Filename: lprmacPhaseMeter2010-11-06T05.13.30.525604.txt
Sampling frequency= 300 Hz
Number of samples= 10973
DeltaL Mean= 5.534070e-003 m
DeltaL PV= 1.413480e-002 m
DeltaL rms= 5.164328e-003 m
Status Not OK: 0



-> acceleration upper value biased by limited sampling time

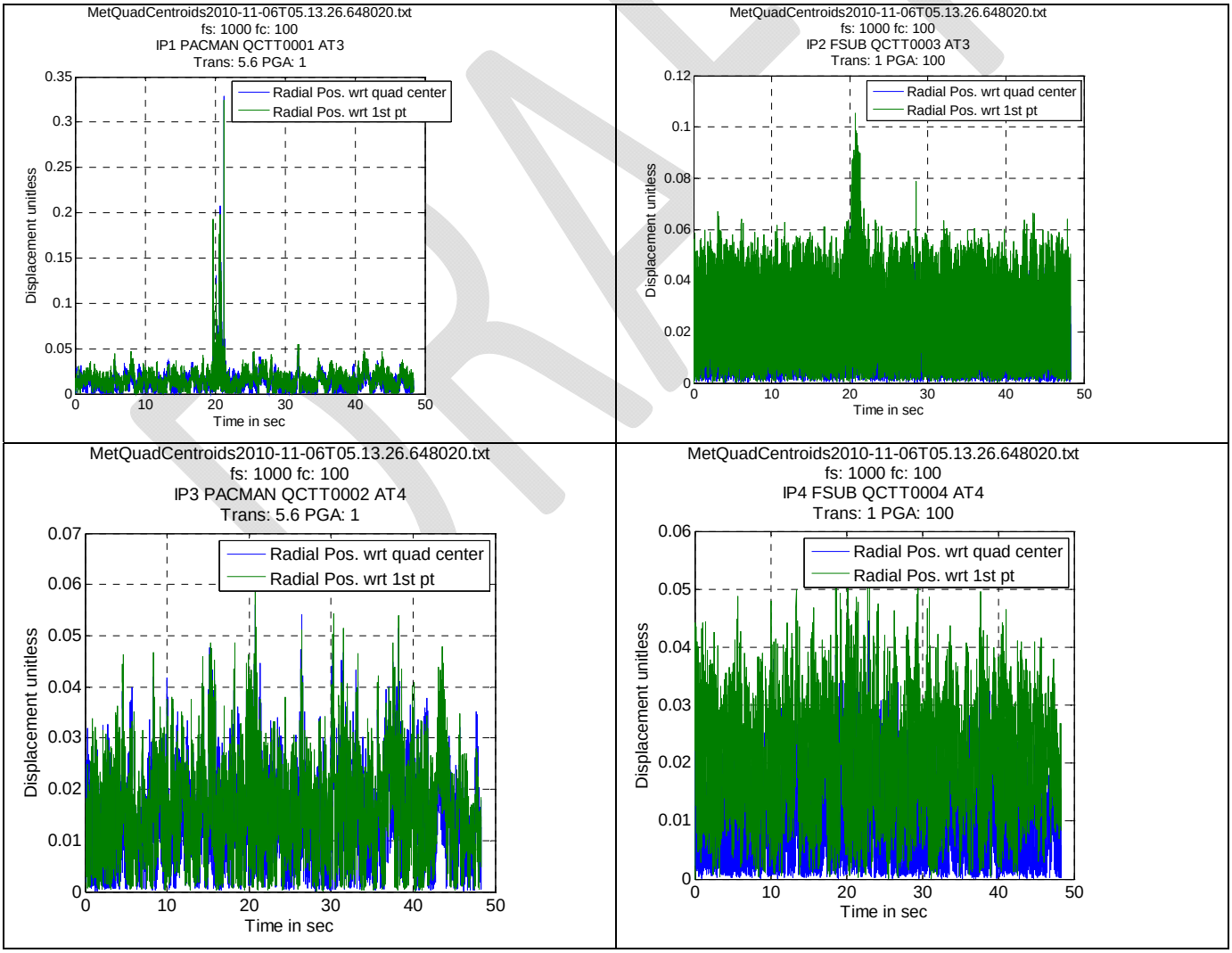
CHECK IF RATE LIMITER IS DEFINED IN SPEED OPL

- ➔ Jump of time of 1 seconds on lprmac: (but not seen on lprmpd or lprma2)
- ➔ problem of the TIM ?

>> seconds(6740:6745)=

22.4644e+000
22.4677e+000
22.4710e+000
23.4744e+000
22.4777e+000
22.4810e+000

>> diff(seconds(6740:6745))=
3.3330e-003
3.3330e-003
1.0033e+000
-996.6670e-003
3.3330e-003



<u>14mm “mechanical” offset and simple fringe scan-> **ΔOPL=28mm**</u>

lprmacPhaseMeter2010-11-06T05.14.50.856016

****

Phase Meter Data

==> Filename: lprmacPhaseMeter2010-11-06T05.14.50.856016.txt

Sampling frequency= 300 Hz

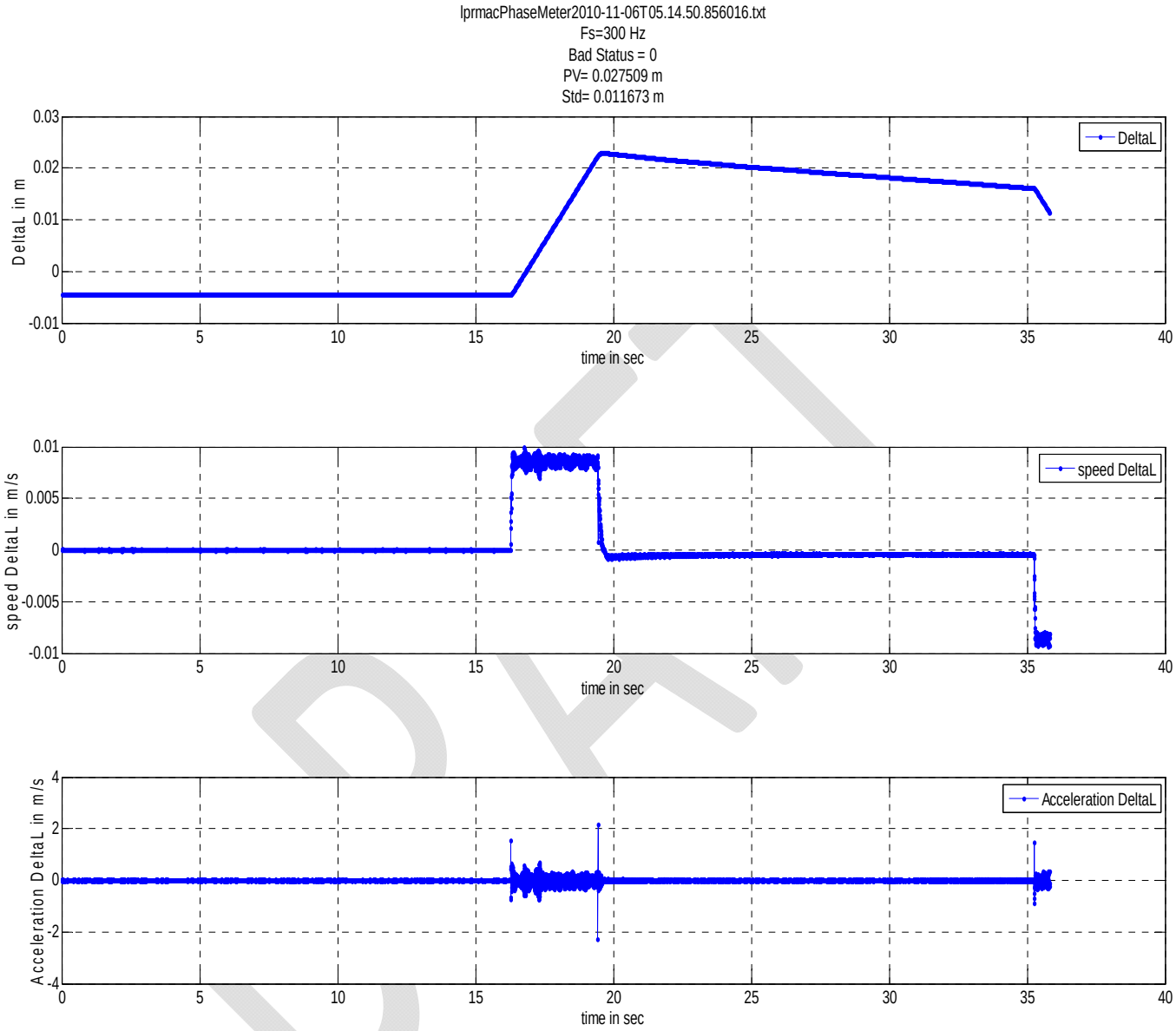
Number of samples= 10748

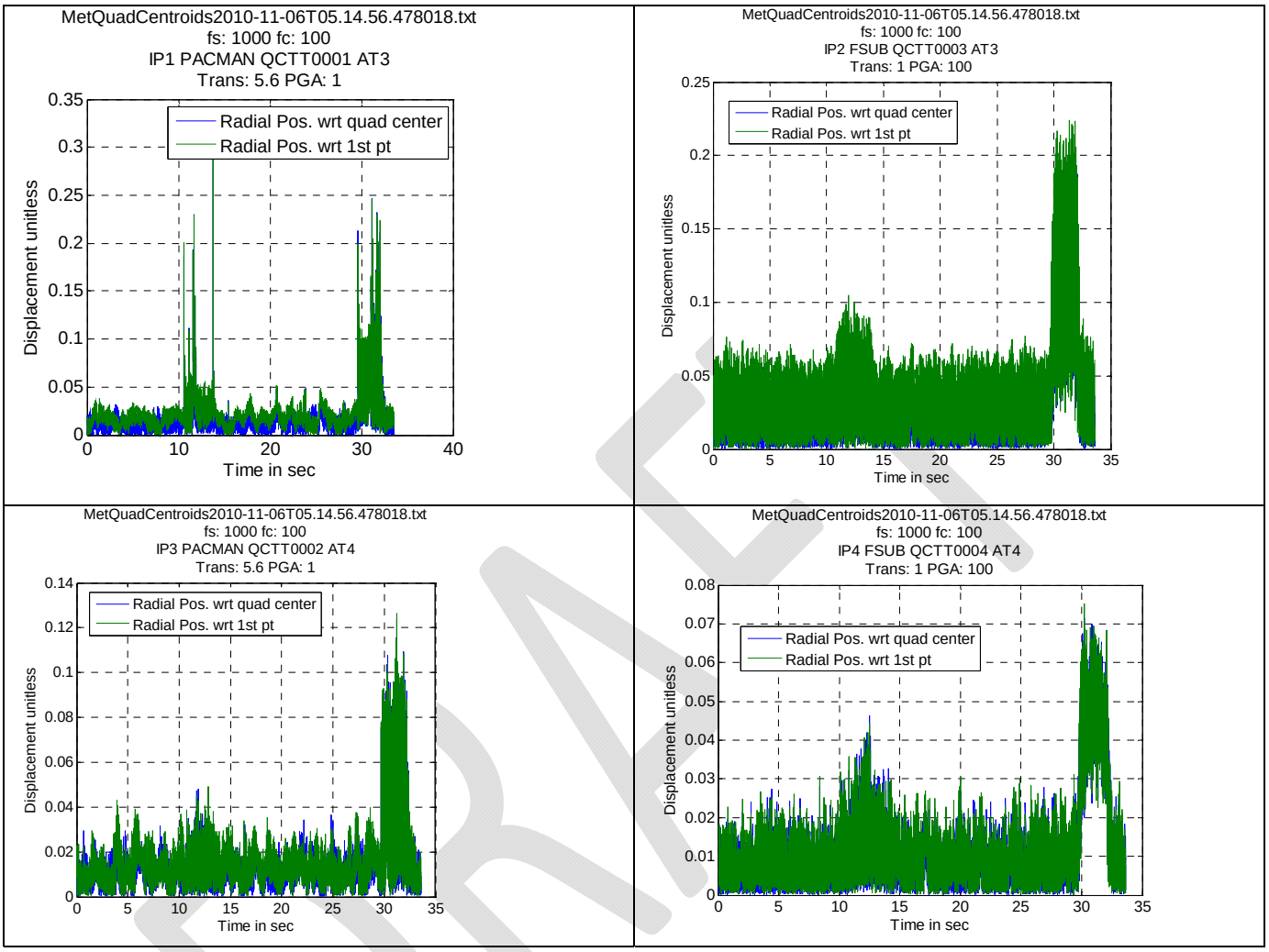
DeltaL Mean= 7.474868e-003 m

DeltaL PV= 2.750869e-002 m

DeltaL rms= 1.167260e-002 m

Status Not OK: 0


lprmacPhaseMeter2010-11-06T05.14.50.856016.txt
Fs=300 Hz
Bad Status = 0
PV= 0.027509 m
Std= 0.011673 m
DeltaL
DeltaL in m
time in sec
speed DeltaL
speed DeltaL in m/s
time in sec
Acceleration DeltaL
Acceleration DeltaL in m/s
time in sec



20mm “mechanical” offset and simple fringe scan->-> **ΔOPL=40mm**

lprmacPhaseMeter2010-11-06T05.17.16.096127

****

Phase Meter Data

==> Filename: lprmacPhaseMeter2010-11-06T05.17.16.096127.txt

Sampling frequency= 300 Hz

Number of samples= 18000

DeltaL Mean= 1.809578e-002 m

DeltaL PV= 3.930830e-002 m

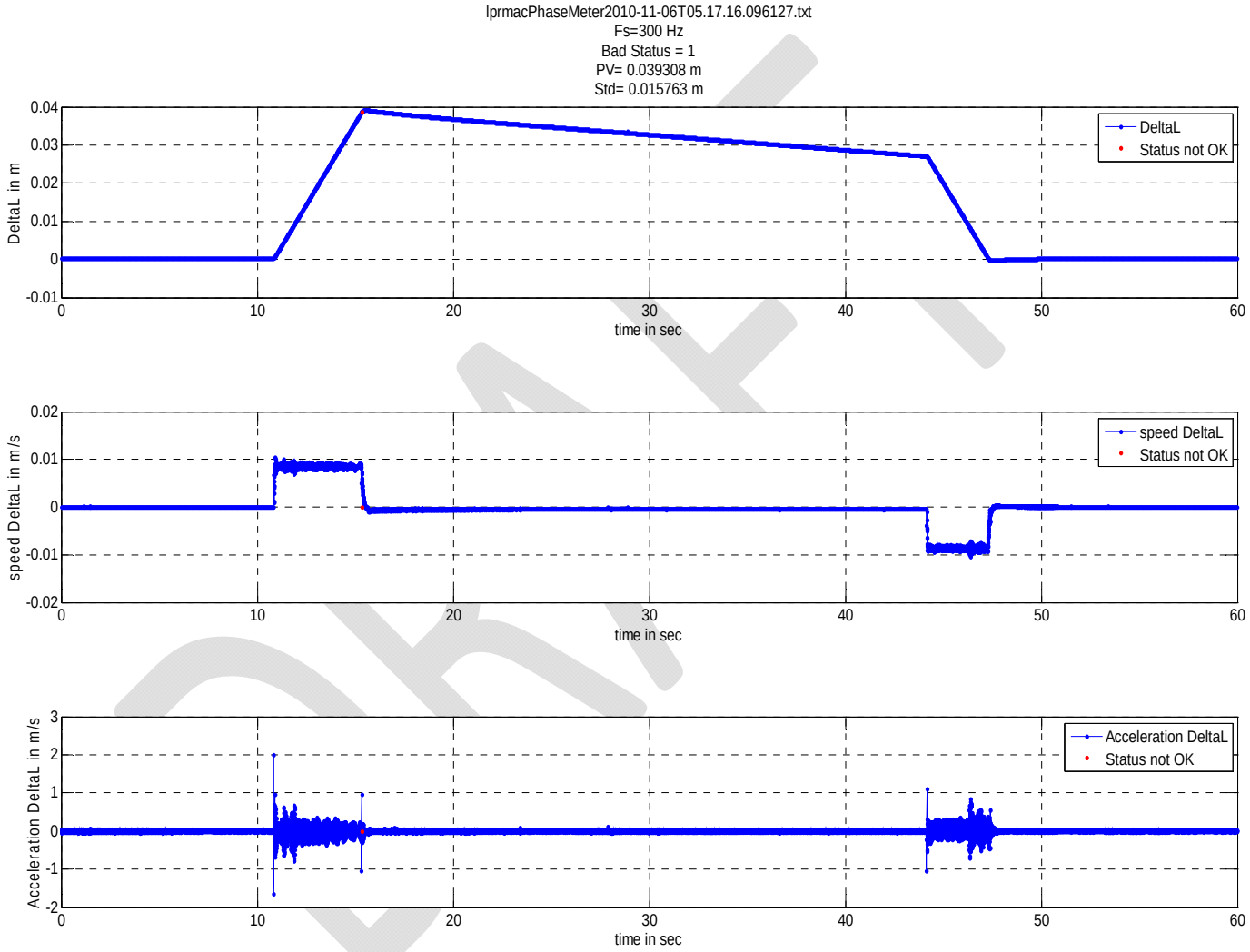
DeltaL rms= 1.576280e-002 m

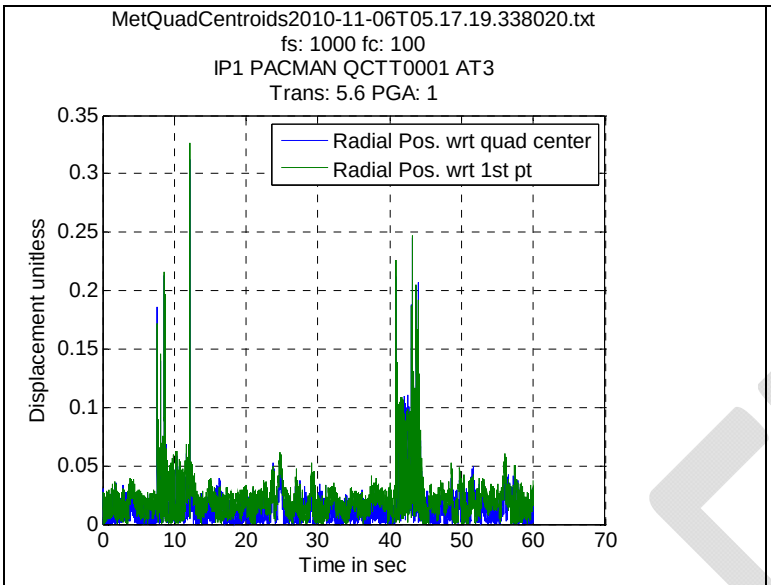
Status Not OK: 1→ 1x 200kHz not detected at time=15.33 sec

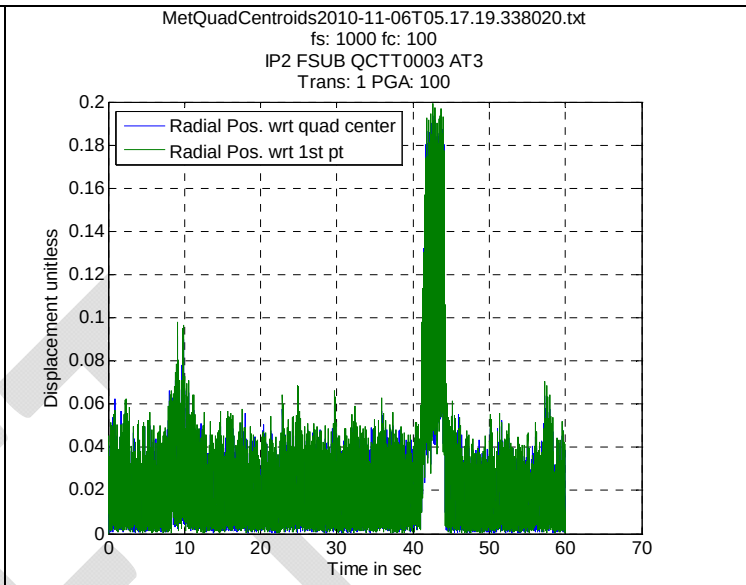
NO 450kHz or 650kHz error…

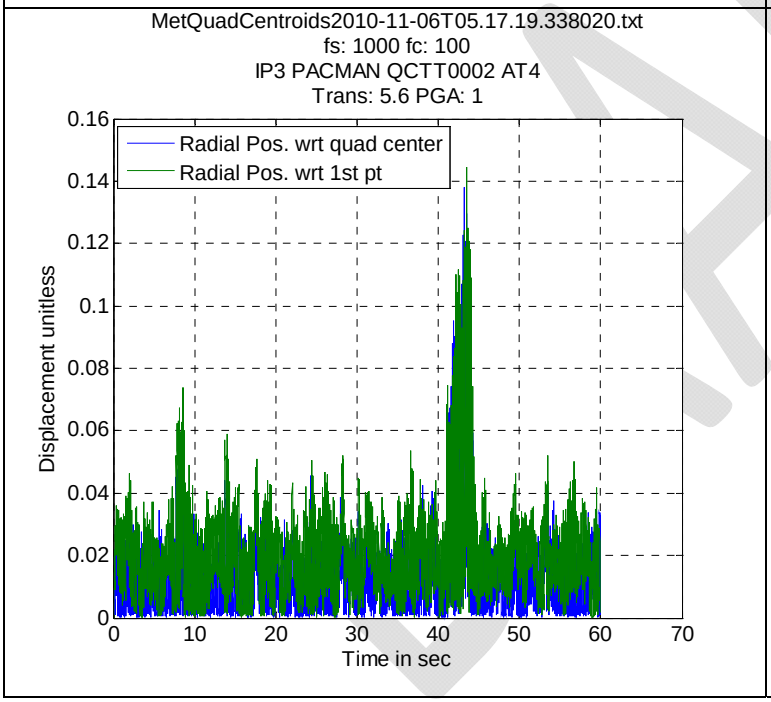
Reasonnable beam variations on the quadcells/no beam lost

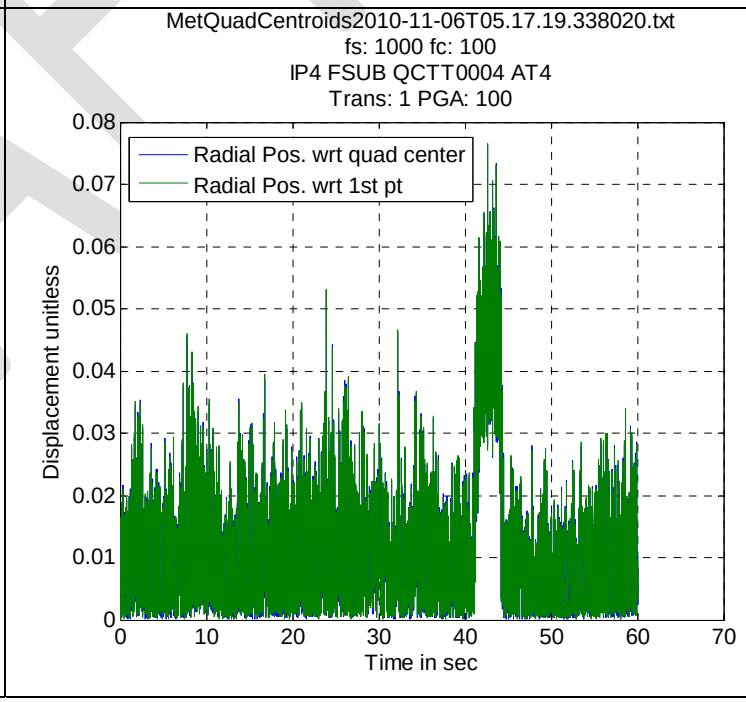
-> Internal Phase meter error ? not related to optical signals?











- ➔ ALSO MOTION ESPECIALLY on IP2~R=0.2!!!! (which has no common optical beam ???)
- ➔ (and to less extend to Ip3 (0.14) and Ip2 (0.08) but this could be typical for a polarization leakage)
- ➔ Smaller Signature seen on lprma2 also
- ➔ Disturbance from DDl1 to DDl 2???

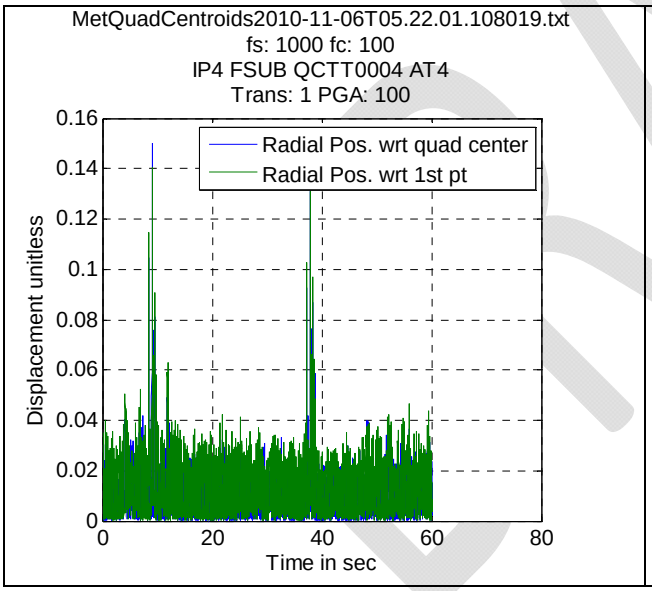
were DDL3 and DDL4 in standby ?

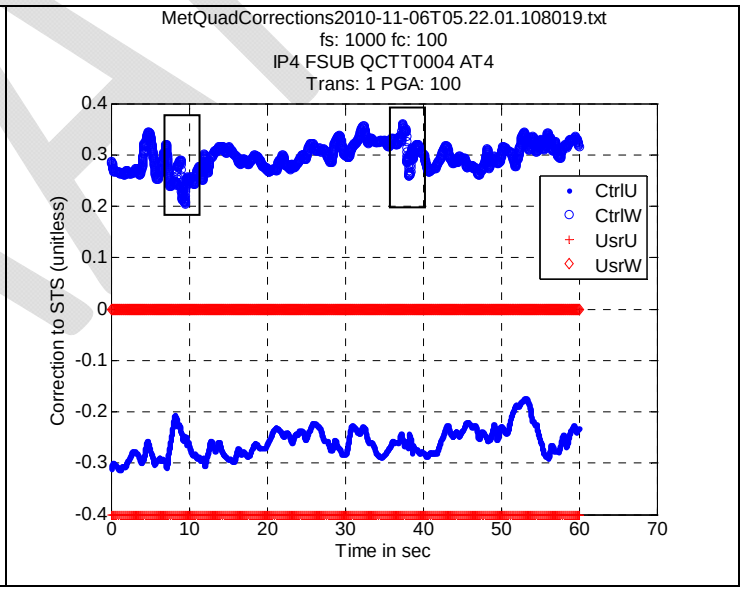
8.4 Impact of OPDc offsets

Blind tracking
DL2=93m (ref.)
DL4=20m (blind tracking, going down)

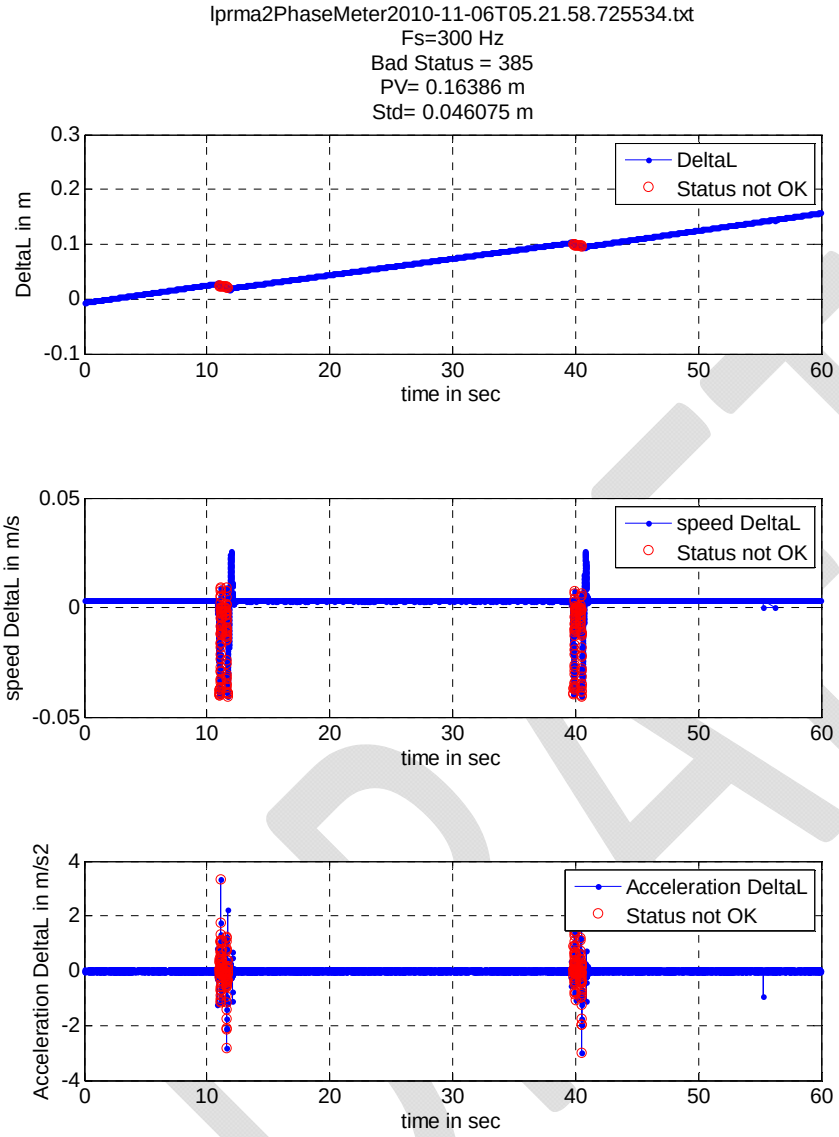
Simple scan of DL4 (added to blind trajectory), amplitude=0.01 period=200
DDL1 in blind tracking

20mm-> glitch
lprma2PhaseMeter2010-11-06T05.21.58.725534.txt
200kHz/450kHz not detected
IP2 OK, R_Pk= 5.932126e-002 p
IP4: slightly out of specs R_Pk= 1.405642e-001 p
Marginal reaction of controller-> indication that beam deformation
No signature on fringe signal (sampling too slow)





➔ If problem with optical beam(=deformation) ; Quadcell eng.file not sufficient to explain the problem…
➔ Need to check at Com14 on beam profiler



Speed and acceleration data during glitch not valid, because DeltaL is not valid !: v_{OPLmax} <±49mm/s, Should be OK

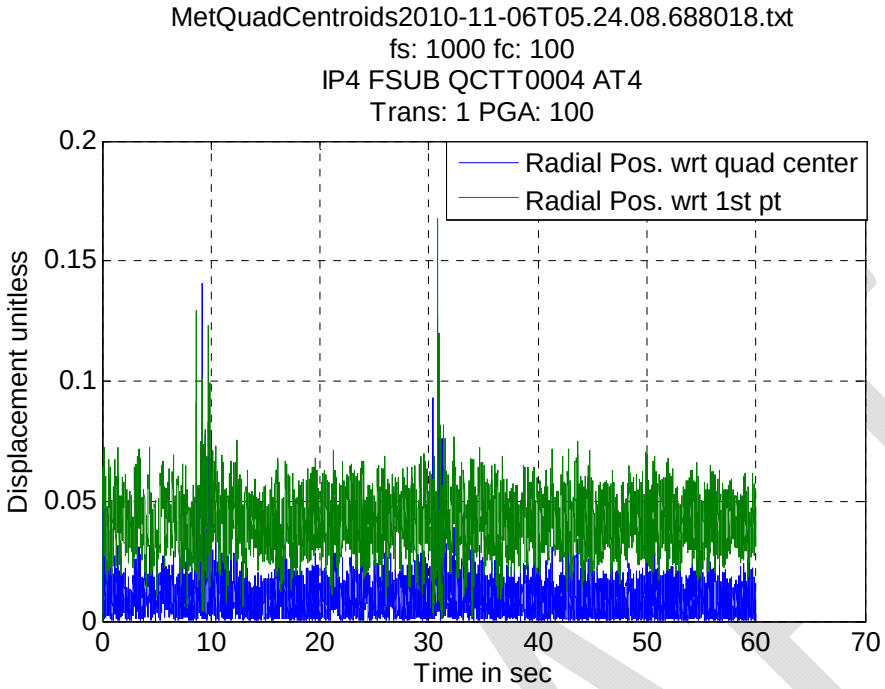
10mm-> glitch

lprma2PhaseMeter2010-11-06T05.24.02.742990.txt

200kHz/450kHz not detected

IP2 OK, R_Pk= 6.029853e-002 p

IP4: R_Pk= 1.676745e-001 p



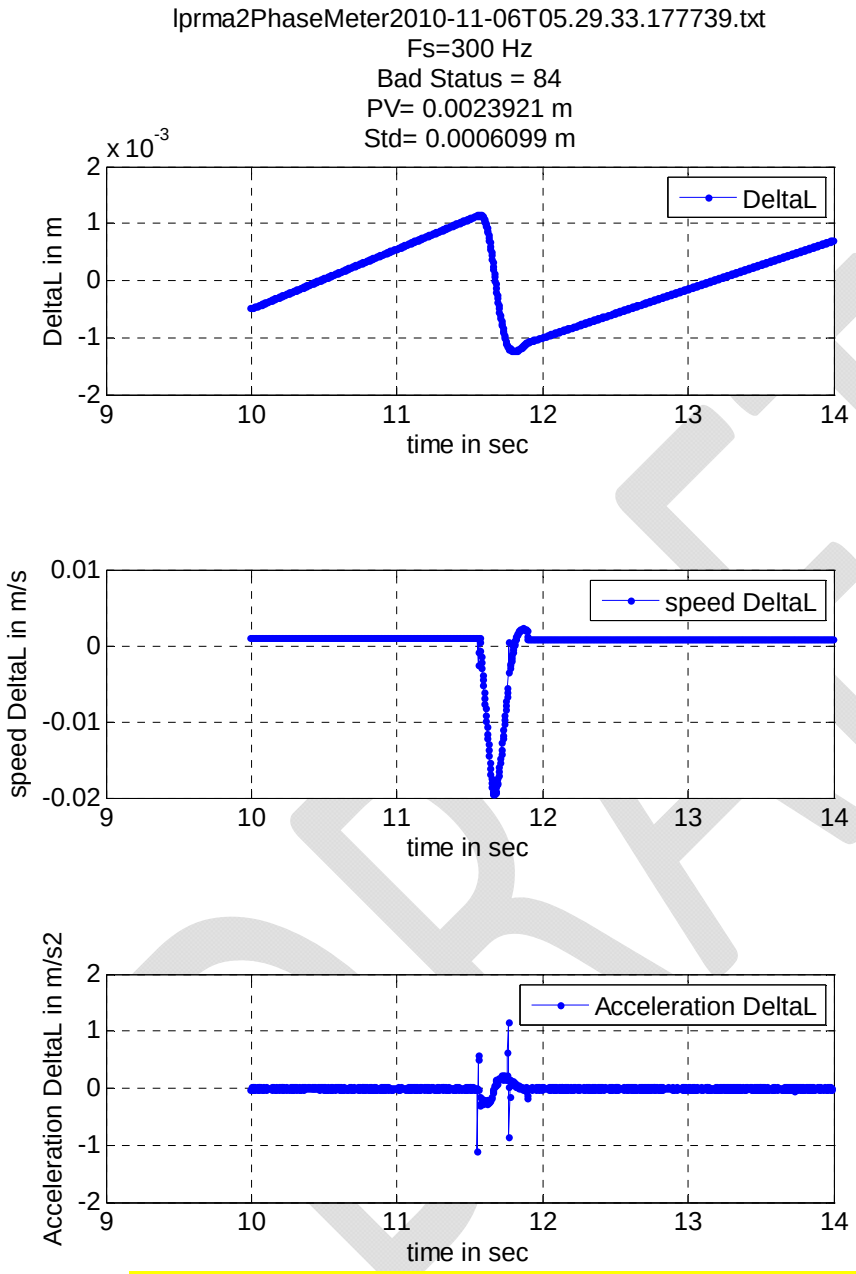
5mm-> glitch
lprma2PhaseMeter2010-11-06T05.25.52.416299.txt
200kHz/450kHz not detected

2mm-> glitch
lprma2PhaseMeter2010-11-06T05.27.19.385682.txt
200kHz/450kHz not detected then 200kHz not detected only [check validity]

1mm-> no glitch on the offset but after scan of 2.5 mm and back to initial position -> glitch
lprma2PhaseMeter2010-11-06T05.29.33.177739.txt

- ➔ See signature of ΔdeltaL=2mm
- ➔

Conclusion: without rate/acceleration limiter, a DL offset >1mm provides a glitch

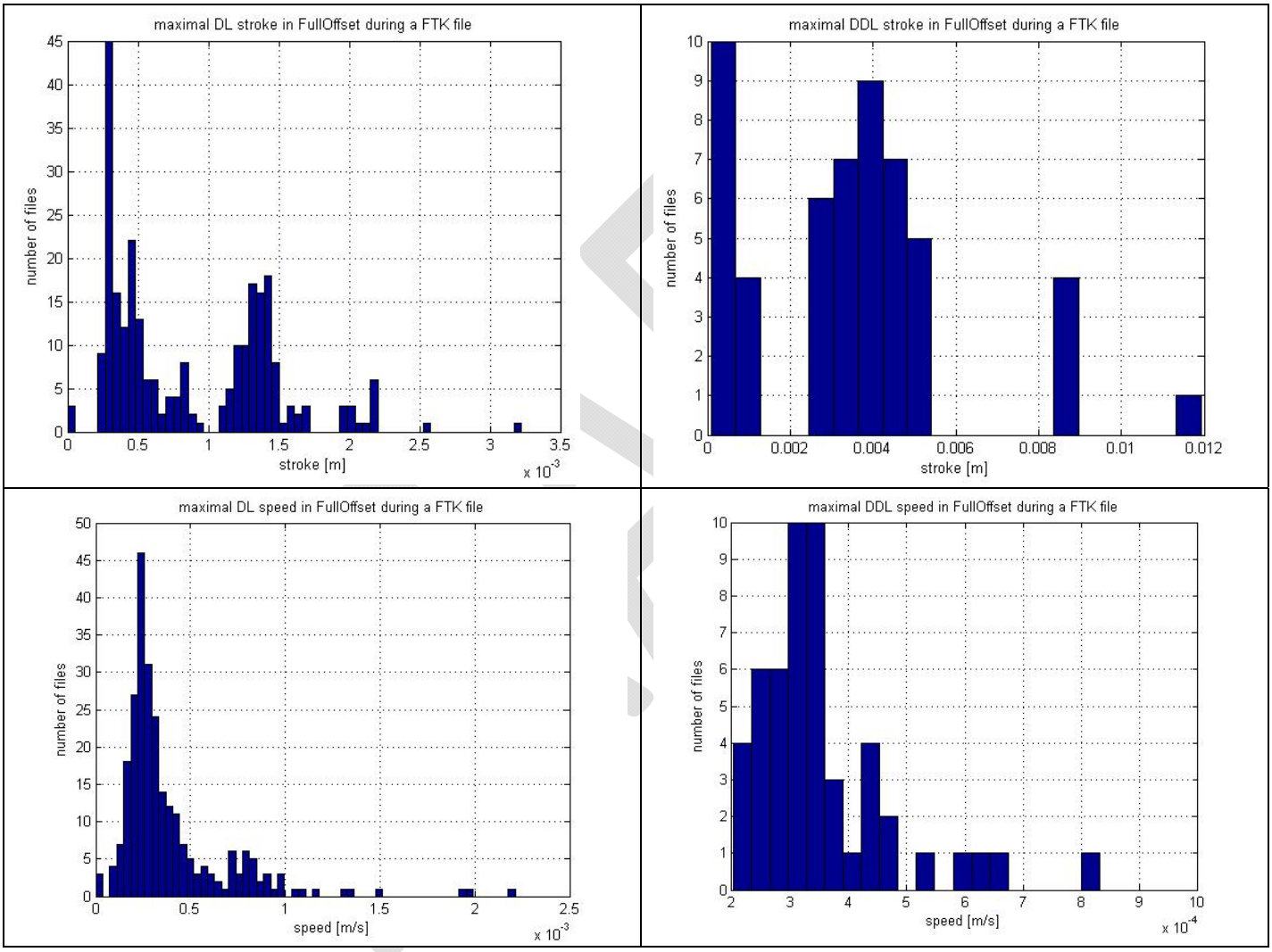


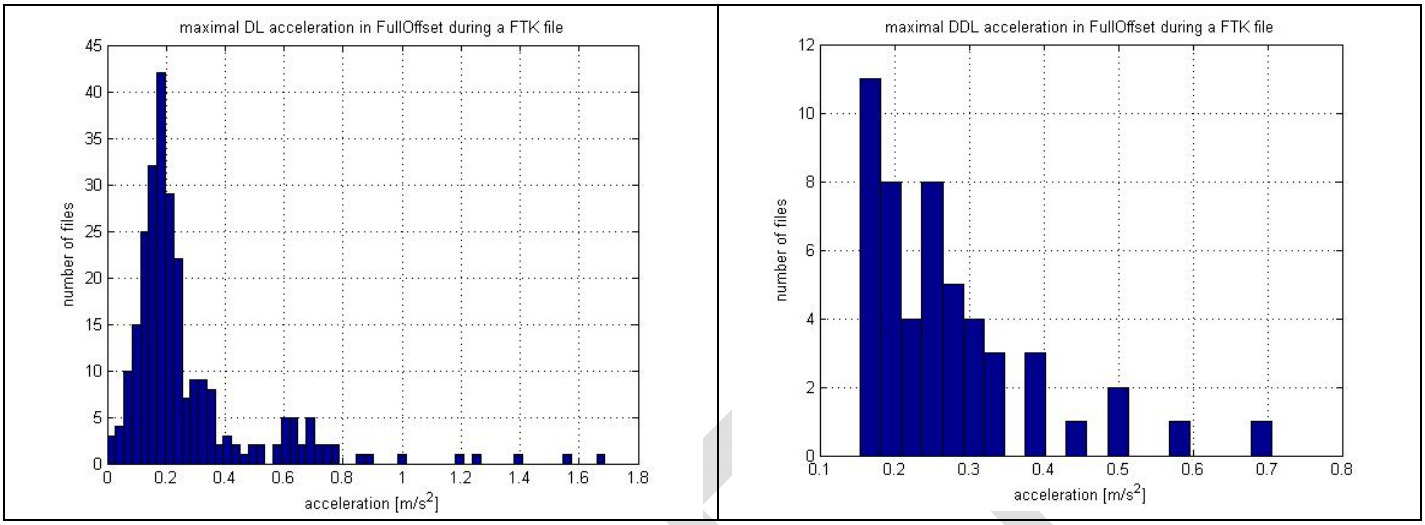
➔ Lprma2 (=OPDc on FSUB): Compatibility with speed 20mm/sec and acceleration of 1 m/s2

8.5 Histograms of the maximum stroke, speed, acceleration of the (d)OPDC FullOffset of COM13 FTK files

Courtesy C.Schmid

The histograms are extracted from most of the fringe tracking files of COM13


maximal DL stroke in FullOffset during a FTK file
number of files
stroke [m]
x 10^-3
maximal DDL stroke in FullOffset during a FTK file
number of files
stroke [m]
maximal DL speed in FullOffset during a FTK file
number of files
speed [m/s]
x 10^-3
maximal DDL speed in FullOffset during a FTK file
number of files
speed [m/s]
x 10^-4



Implementation of a DL rate Limiter
Courtesy Nicola DiLieto:
"…4 new parameters, tunable from the database without need to reboot or initialize, are to be created and passed to ratelim_param:

- Maximum Acceleration, default 0.01 (10 mm/s^2)
- Maximum Velocity, default 0.001 (1 mm/s)
- Linger threshold, default 50e-6
- Linger timeout, default 10

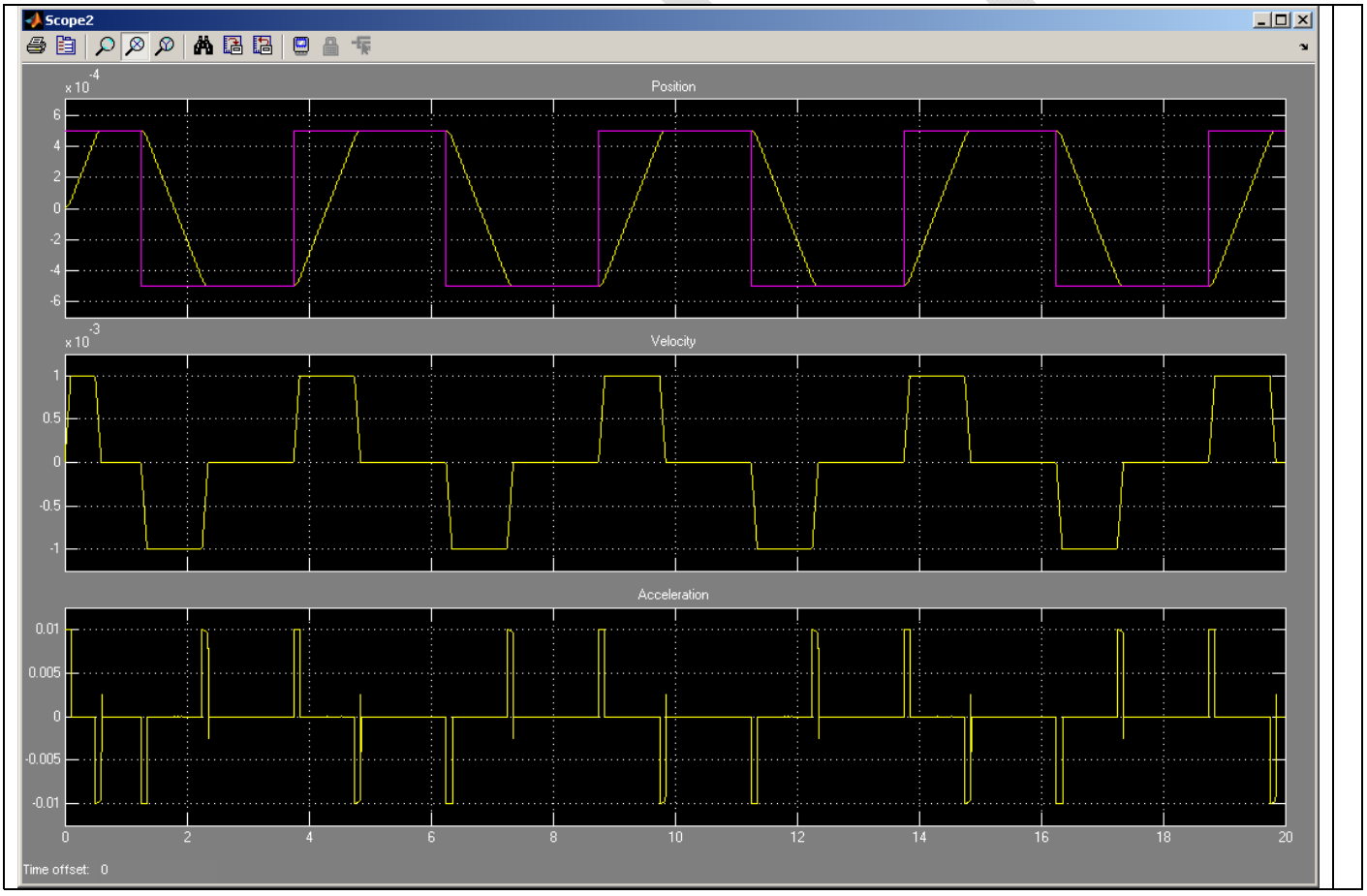
The code has three states: OFF, ACTIVE, LINGER. The latter is is necessary to prevent step changes when the rate limiter is disabled. In this state the rate limiter code will keep limiting acceleration and velocity until either the difference between the rate limited target and the original target goes below the threshold, or the timeout expires.

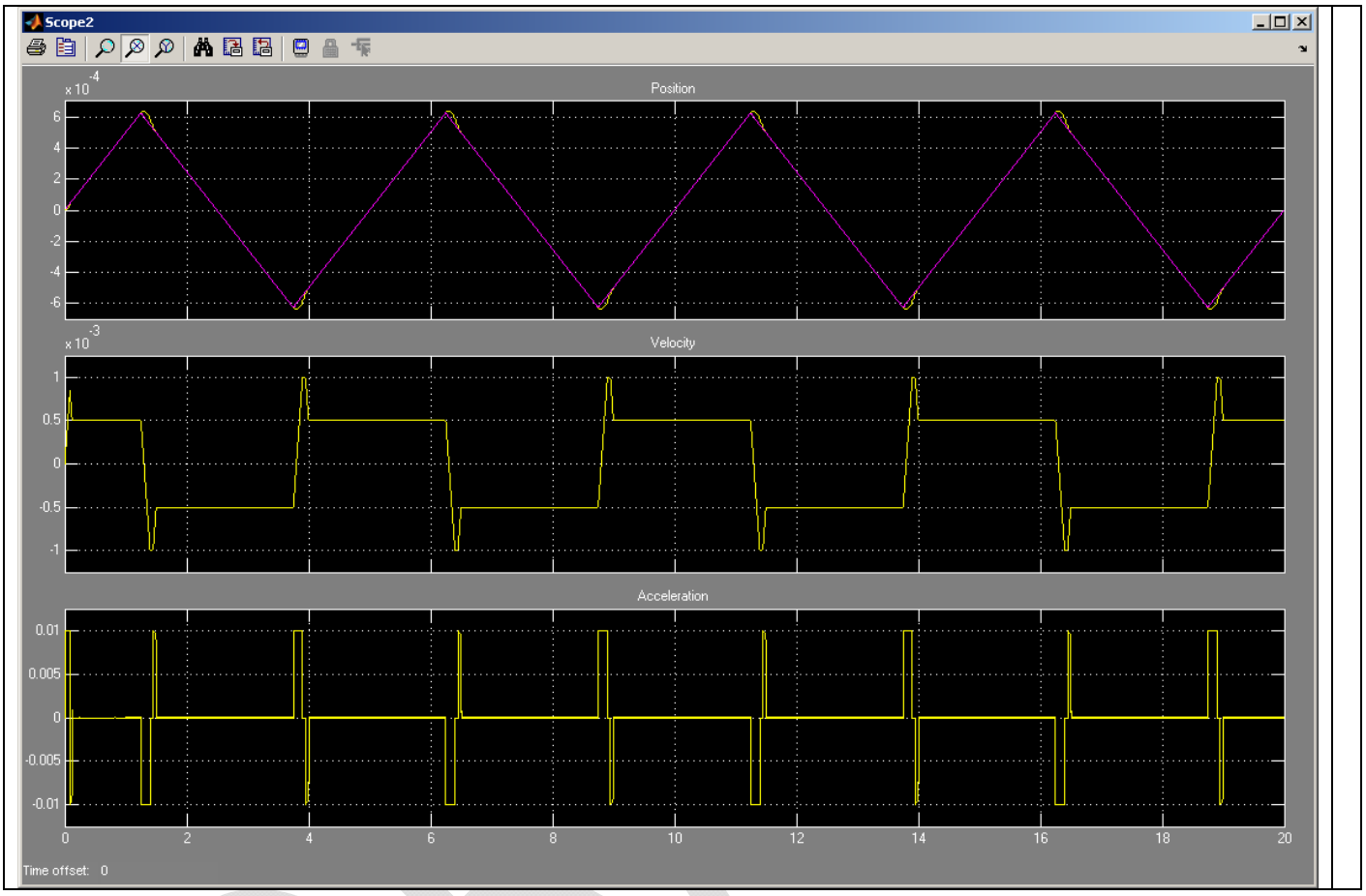
Apart from the reset and set parameters routines, which are trivial and self explained in the code, you need to do the following at each iteration of the delay line servo controller. It is particularly important that the ratelim_update function is called at each step, even if the limiter is disabled. The original position/velocity setpoints mentioned below are intended to include everything, blind trajectory, vibration offset, real time offset, anything else, just before they go into the calculation of the control loop.

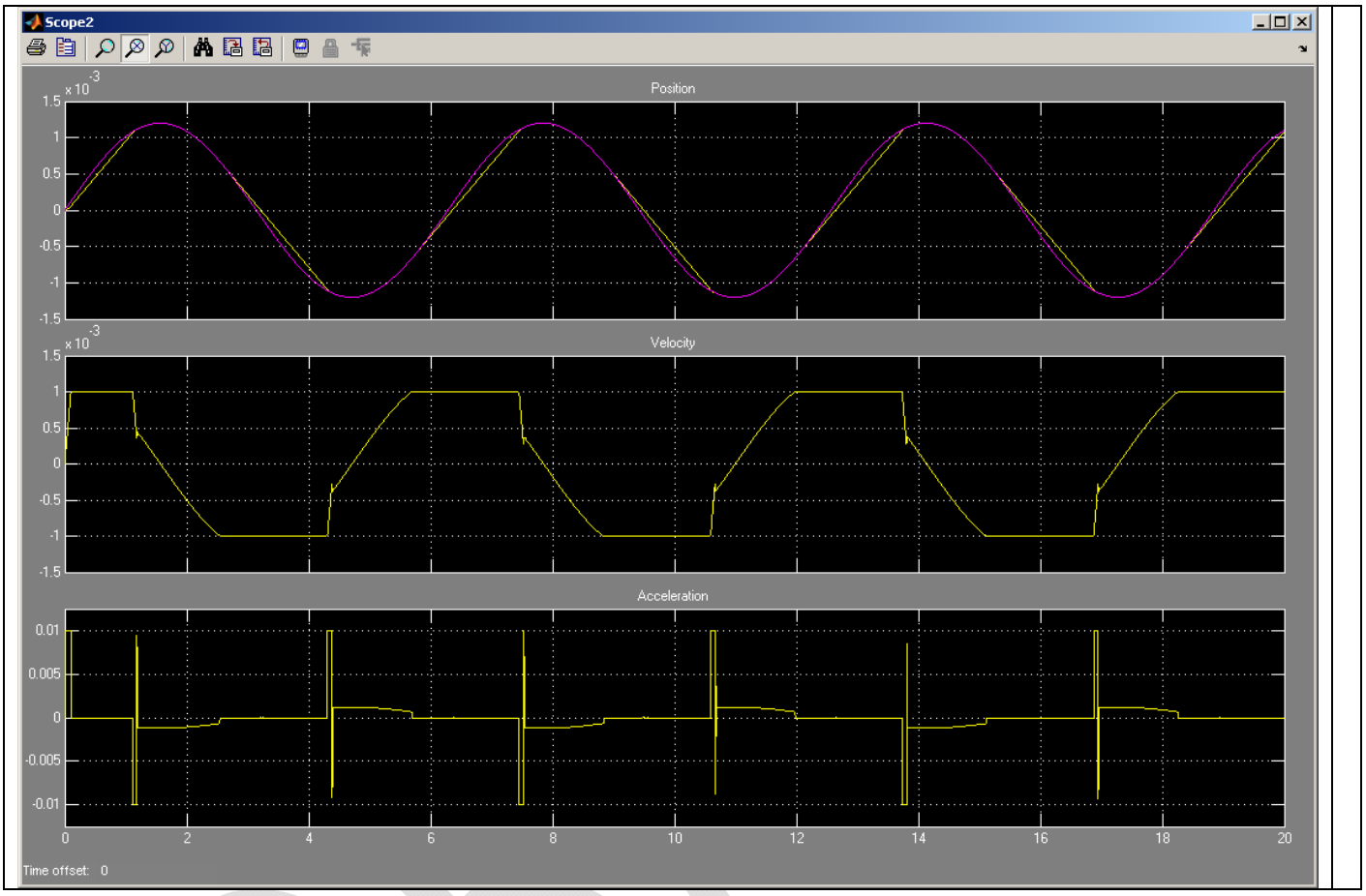
```
if (<RTOffsetValid on RMN> == 2)
{
   ratelim_update(<pointer to ratelim struct>, ENABLE, <original position setpoint>);
}
else
{
   ratelim_update(<pointer to ratelim struct>, DISABLE, <original position setpoint>);
}
```

```
if (ratelim_active(<pointer to ratelim struct>))
{
<position setpoint> = ratelim_position(<pointer to ratelim struct>);
<velocity setpoint> = ratelim_velocity(<pointer to ratelim struct>);
}
else
{
<position setpoint> = <original position setpoint>;
<velocity setpoint> = <original velocity setpoint>;
}
```

Note also that since OPDC will send RTOffsetValid = 2 instead of 1 for PRIMA, you'll probably also need to fix all the places that check RTOffset Valid== 1, replacing them with (RTOffset Valid== 1 || RTOffset Valid==2). …"




Scope2
Position
x 10^-4
6
4
2
0
-2
-4
-6
Velocity
x 10^-3
1
0.5
0
-0.5
-1
Acceleration
0.01
0.005
0
-0.005
-0.01
0
2
4
6
8
10
12
14
16
18
20
Time offset: 0


Scope2
Position
x 10^-3
1.5
1
0.5
0
-0.5
-1
-1.5
Velocity
x 10^-3
1.5
1
0.5
0
-0.5
-1
-1.5
Acceleration
0.01
0.005
0
-0.005
-0.01
0
2
4
6
8
10
12
14
16
18
20
Time offset: 0

8.6 First dual fringe tracking with metrology

DL represet to get 1 hour tracking time
DL2=53m
DL4= 27m going down

track on Both FSU's with Metrology stable recording:
-->GENERIC_310_0006
-->GENERIC_310_0007
-->GENERIC_310_0008

Record first file with 2 FSU's and full metrology using a truncated version of the astrometric template (no dark, no flat, no swap)
-->PACMAN_OBJ_ASTRO_310_0001.fits

FSUB is not tracking very well.
(since there is no OPD model, fringe are obviously drifting)

At the end of the astrometric template lab guiding was stopped as well as fringe tracking.
-> glitch again

[DATA NOT AVAILABLE ON WPACMAN in Garching], TBC where to get them

9 SATURDAY 6/11/2010

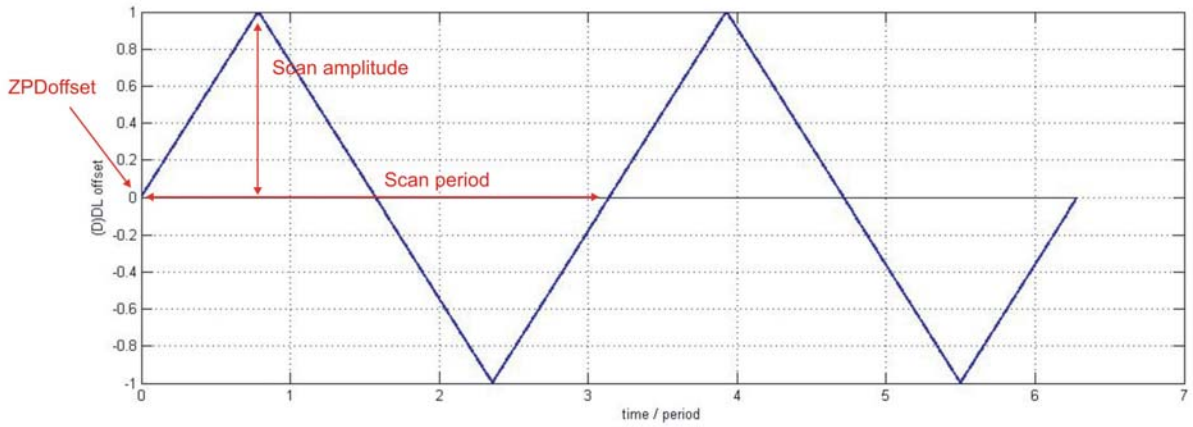
9.1 Day-time activities

- Test osf script PRIMET_PREPARE_STS
- Check Marcel positions on IRIS; no update of PACMAN instrument pointing offsets necessary
- Check Orientation of FSM(U,W)<->IRIS(Xi,Yi)<->ACU(Xa,Ya)
- Test Astro-template without Dark/Flat calibration: Problem with swap (with ignored telescope),
    - DL2-metrology glitch; DL4 does not indicate “no remaining tracking time”
    - DDL4 moving whereas it should not

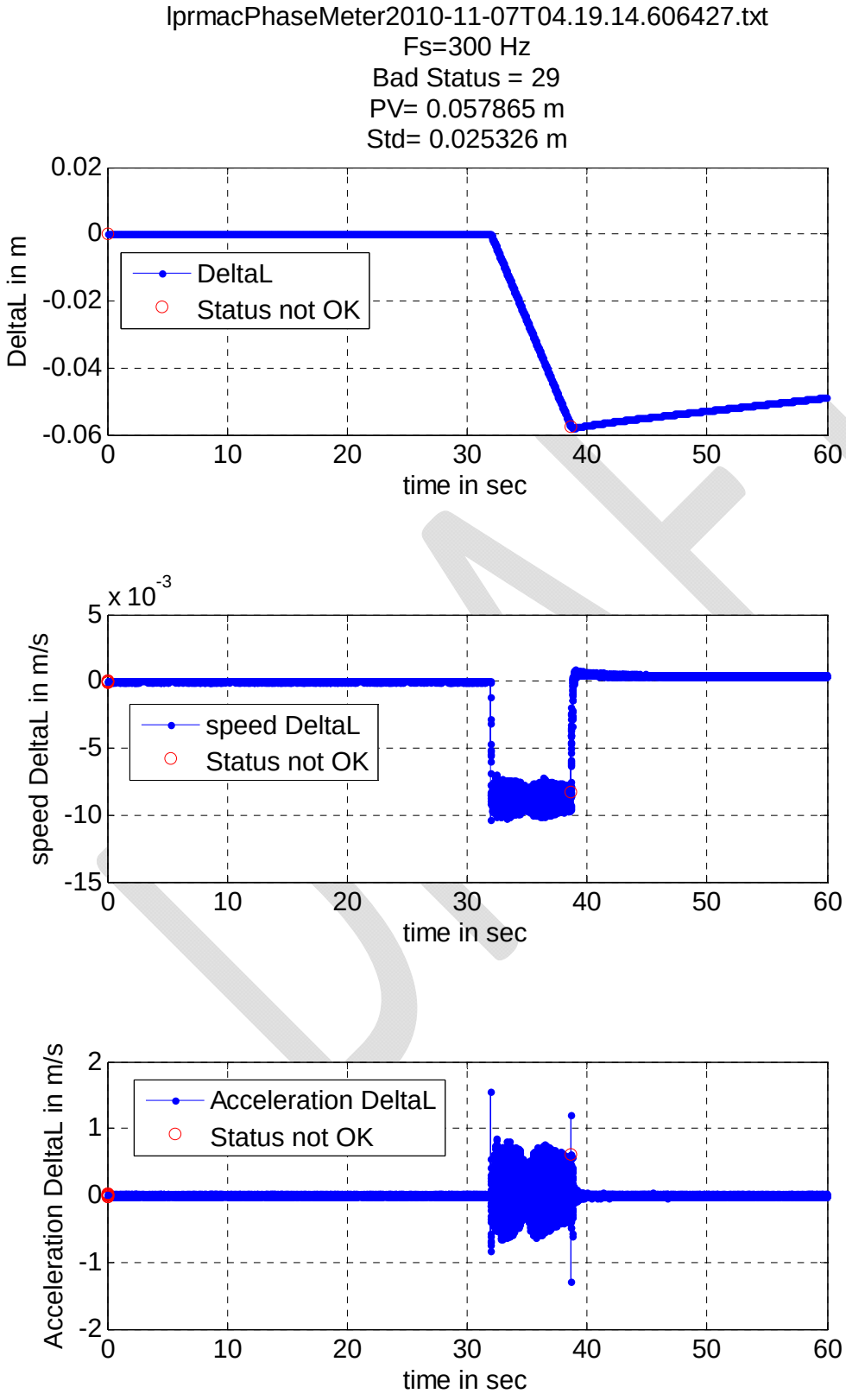
9.2 PRIMET operation during fringe tracking on FSUB and fringe scan/search on FSUA

PS HD24071J
Fringe track on FSUB and look for fringes on FSUA with a fast scan of DDL1 using dOPDc
ZPDoffset_mechanical=-2.25 cm --> 5.5 cm OPL

Scan Amplitude_mechanical=5.5 cm→ 11 cm OPL
Scan Period=1100 seconds
Leading to scanning_speed=amplitude_OPL/(period/4)=400e-6 m/s
And a scan centered on initial blind trajectory value



No quadcell data
Phase Meter Data
==> Filename: ***lprmacPhaseMeter2010-11-07T04.19.14.606427.txt***
Sampling frequency= 300 Hz
Number of samples= 18000
DeltaL Mean= -2.212460e-002 m
DeltaL PV= 5.786496e-002 m
DeltaL rms= 2.532558e-002 m
Status Not OK: 29:
PM overflow the first 0.1 sec of the file ????not realistic for lprmac ?
1x 650kHz Probe not detected time=38.63s (after applying the offset and initiating the scan)
Speed after applying the offset (t>40 sec)~ 400 microns/sec: OK


lprmacPhaseMeter2010-11-07T04.19.14.606427.txt
Fs=300 Hz
Bad Status = 29
PV= 0.057865 m
Std= 0.025326 m
DeltaL in m
DeltaL
Status not OK
time in sec
x 10^-3
speed DeltaL in m/s
speed DeltaL
Status not OK
time in sec
Acceleration DeltaL in m/s
Acceleration DeltaL
Status not OK
time in sec

****

Phase Meter Data

==> Filename: ***lprma2PhaseMeter2010-11-07T04.19.17.363088.txt***

Sampling frequency= 300 Hz

Number of samples= 18000

DeltaL Mean= 5.816095e-003 m

DeltaL PV= 3.457361e-001 m

DeltaL rms= 1.108510e-001 m

Status Not OK: 909

- PM overflow the first 0.04 sec of the file (11 samples)-> not realistic
- Standard PM overflow after 150mm
- Time jump of 1 sec ~ 30 sec after beginning of the file
- Why jump of 60 microns on lprma2 ??

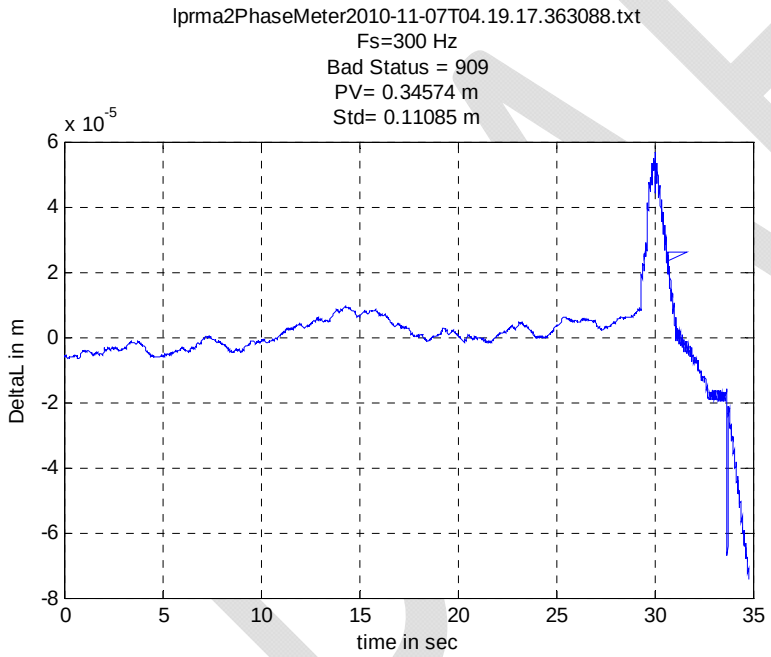


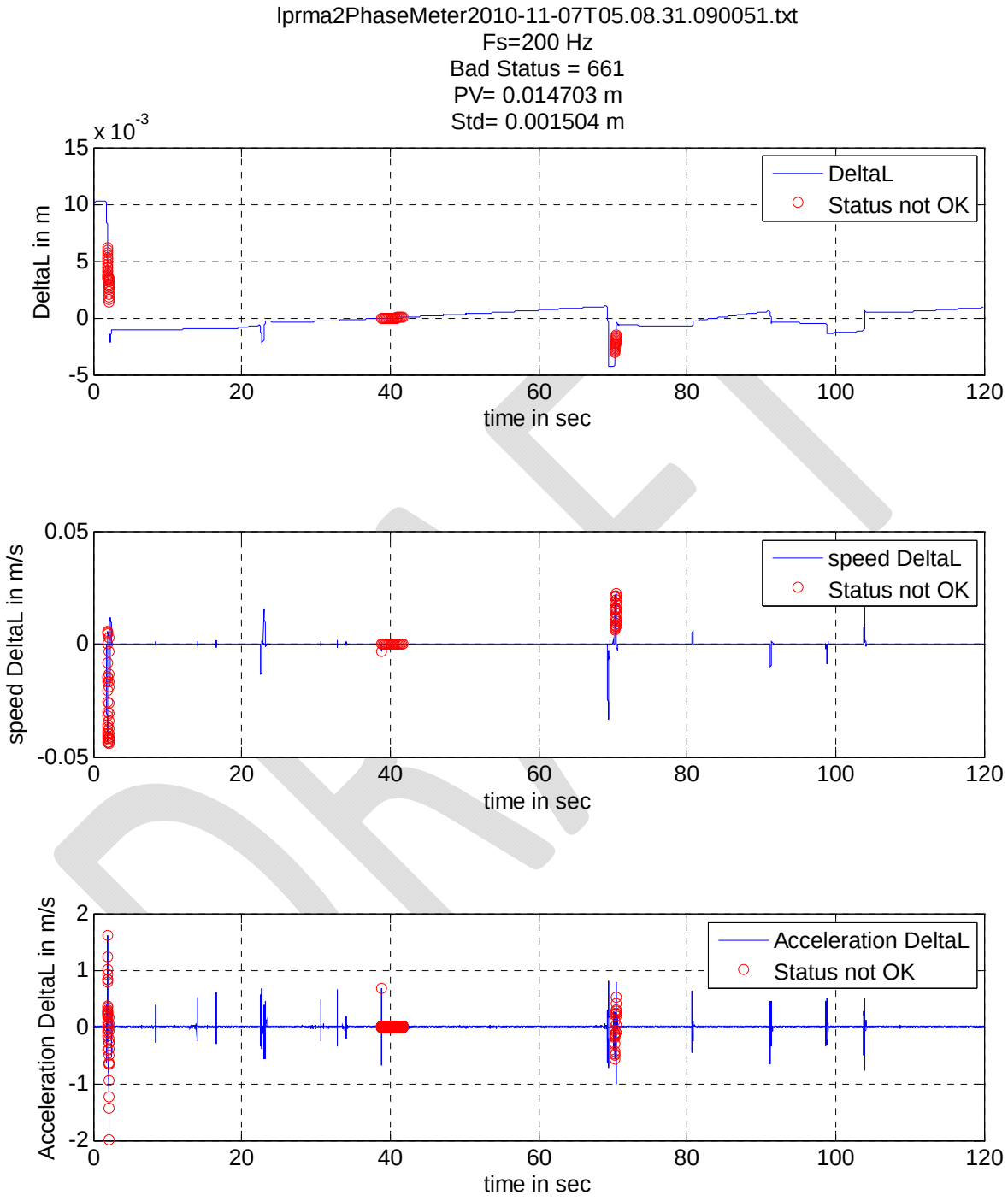
Figure 2: detrend of *lprma2PhaseMeter2010-11-07T04.19.17.363088.txt (before the lprma2 overflow)*

To be checked:

- Pm overflow not realistic for lprmac/lprma2
- OPL jump on lprma2 although only DDL1 is supposed to be moved.
- Time jump on lprma2:
- Why lprmac glitches in the transition [offset-> scan] and not in the transition [no offset->offset at max speed]

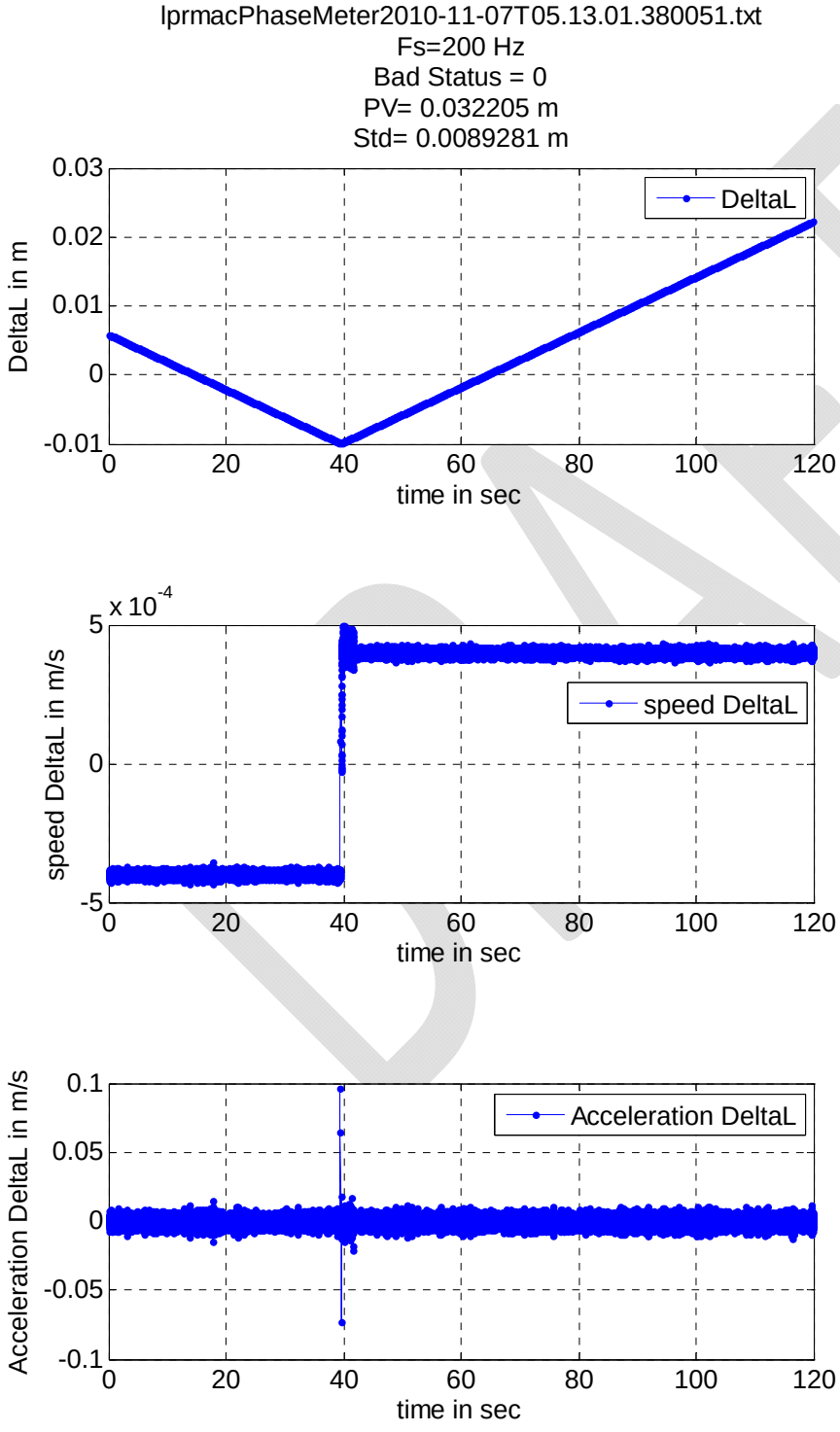
Other object:
FSUB: fringe search, fringe detected and tracked, fringe search again and tracked again:
These steps should be seen on :
lprma2PhaseMeter2010-11-07T05.08.31.090051.txt (No quadcell data)

- ➔ After unwrapping and detrending the blind trajectory
- ➔ Hard to find similarity with above sequence…: check impact of detrend


lprma2PhaseMeter2010-11-07T05.08.31.090051.txt
Fs=200 Hz
Bad Status = 661
PV= 0.014703 m
Std= 0.001504 m
x 10^-3
DeltaL in m
DeltaL
Status not OK
time in sec
speed DeltaL in m/s
speed DeltaL
Status not OK
time in sec
Acceleration DeltaL in m/s
Acceleration DeltaL
Status not OK
time in sec

FSUA: fringe scan using dOPDc

lprmacPhaseMeter2010-11-07T05.13.01.380051.txt (No quadcell data)



FSUB tracking and fringe scan on FSUA : ***GENERIC_311_0018***

10 SUN 7/11

10.1 Day-time Activities:

- Compatibility PRIMET/IRIS background: definition of the fsm offset directions for the IRIS background
- Update osf PRIMET_PREPARE_STS
- Check Marcel positions on IRIS; no update of PACMAN instrument pointing offsets necessary

10.2 Dual fringe tracking with PRIMET and First data valid for FSU sky calibration

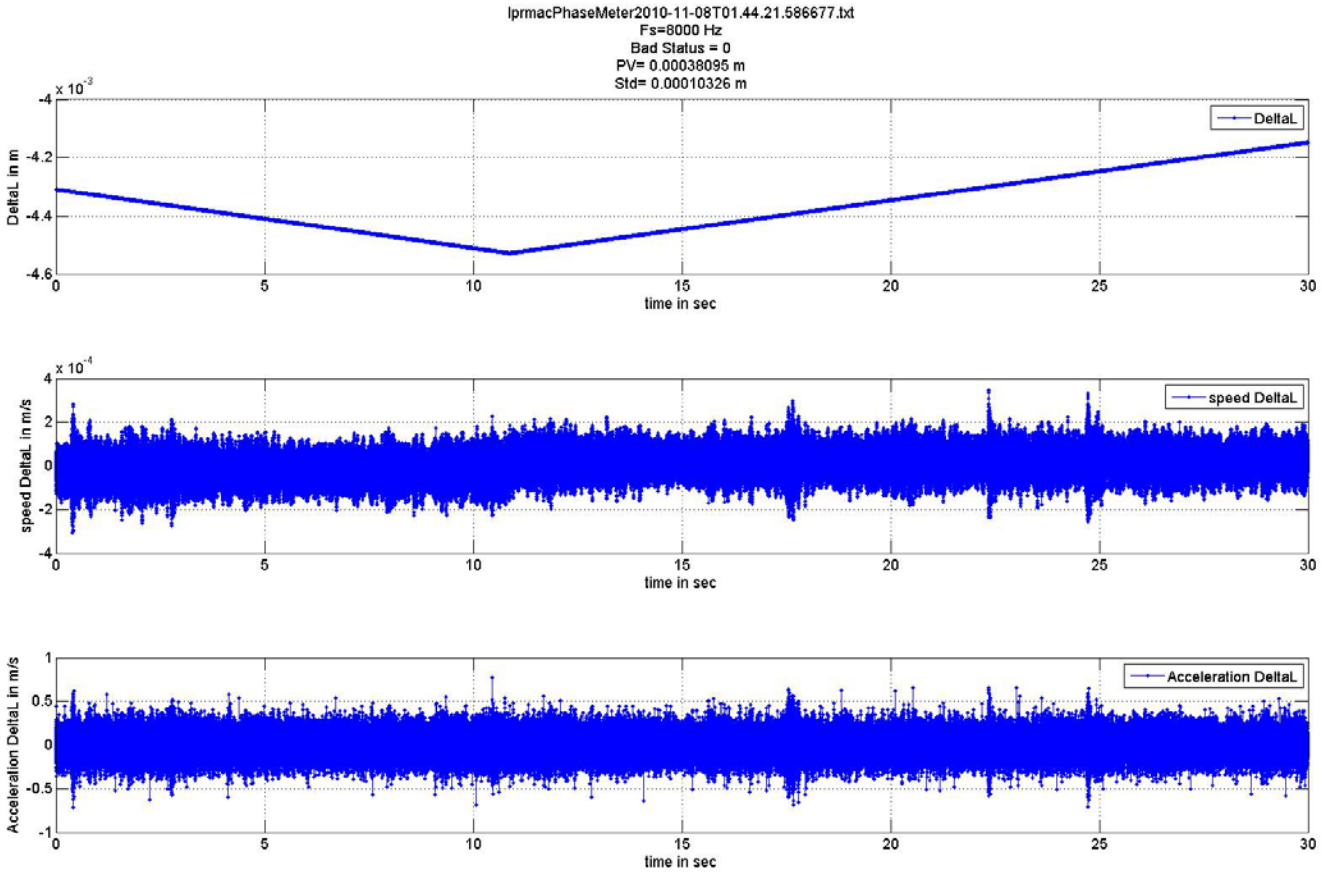
- Dual fringe tracking + metrology
- Fringe tracking on FSUB+fringe scanning on FSUA + PRIMET-> valid for sky calibration data
- Test swap
- Test impact of dark/flat calibration with ACU

Engineering file during fringe scan

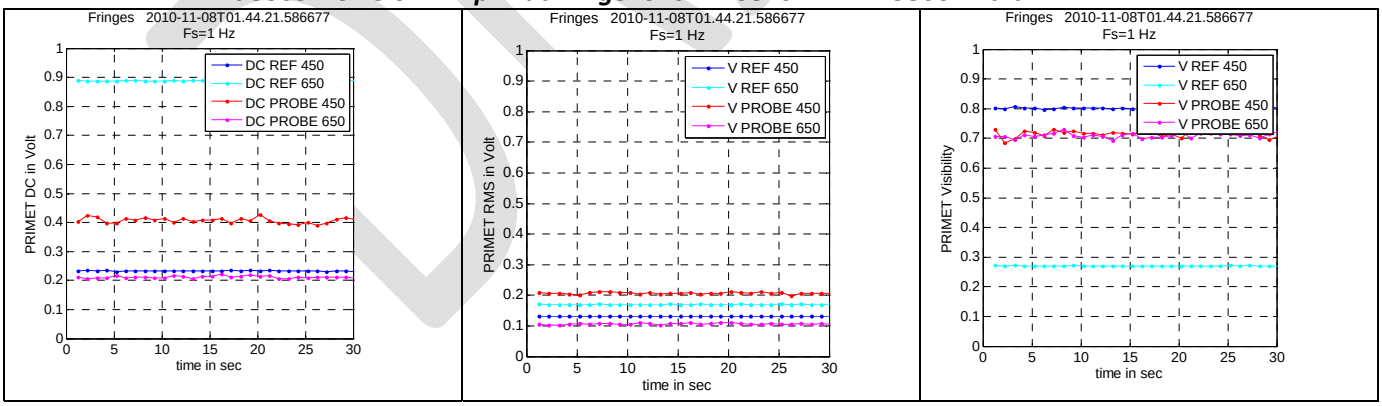
-rw-rw-rw- 1 vx vlt 20800392 Nov 8 01:47 lprmacPhaseMeter2010-11-08T01.44.21.586677.txt

****

Phase Meter Data
==> Filename: lprmacPhaseMeter2010-11-08T01.44.21.586677.txt
Sampling frequency= 8000 Hz
Number of samples= 240000
DeltaL Mean= -4.367090e-003 m
DeltaL PV= 3.809455e-004 m
DeltaL rms= 1.032558e-004 m
Status Not OK: 0



-rw-rw-rw- 1 vx vlt 3305 Nov 8 01:47 lprmacFringe2010-11-08T01.44.21.586677.txt



-rw-rw-rw- 1 vx vlt 21040433 Nov 8 01:46 lprma2PhaseMeter2010-11-08T01.44.21.583802.txt

****

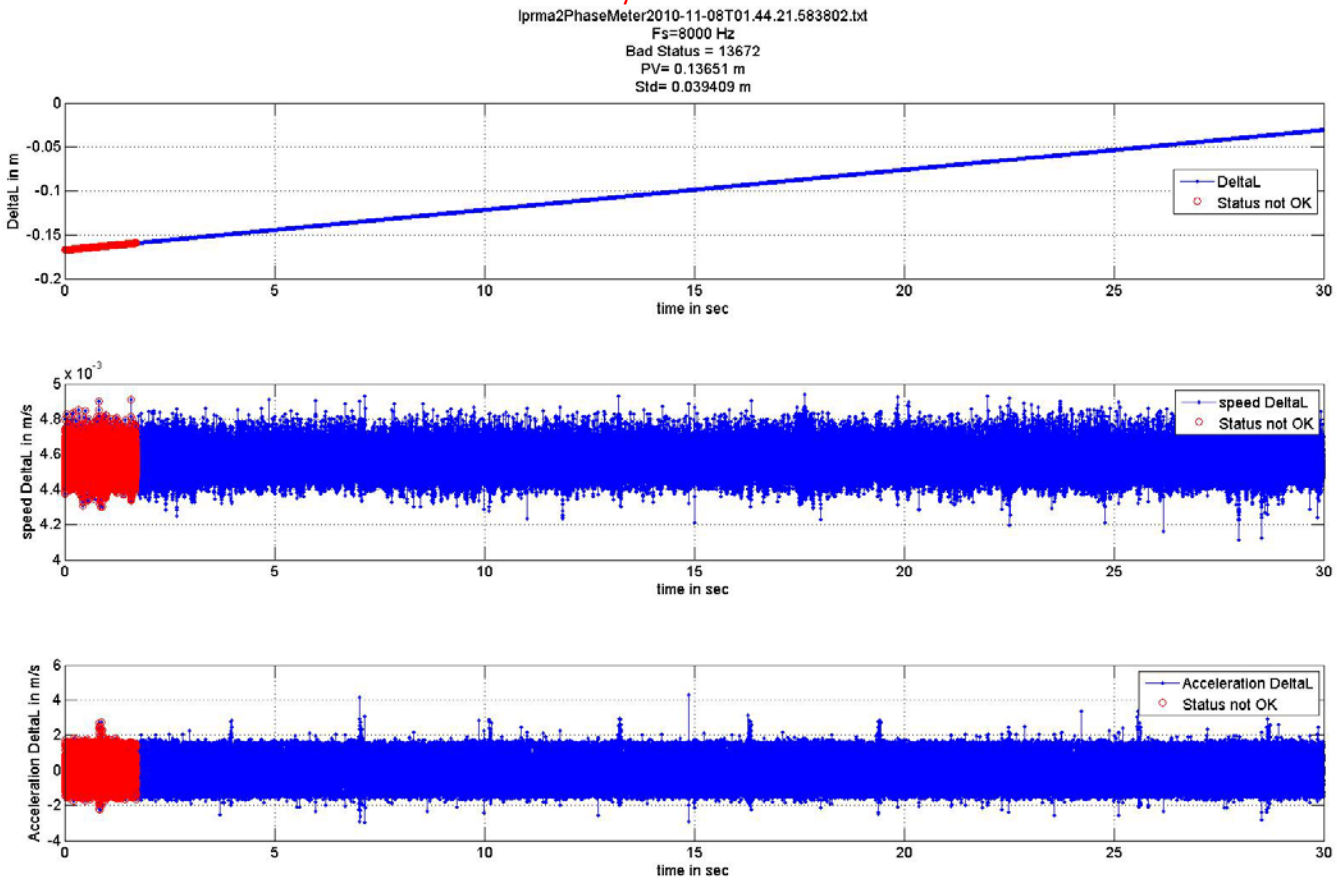
Phase Meter Data

==> Filename: lprma2PhaseMeter2010-11-08T01.44.21.583802.txt

Sampling frequency= 8000 Hz

Number of samples= 240000

DeltaL Mean= -9.876619e-002 m
DeltaL PV= 1.365056e-001 m
DeltaL rms= 3.940870e-002 m
Status Not OK: 13672→ residual PM overflow only



MetQuadCentroids2010-11-08T01.44.19.904018.txt

```
% Parameters of the controllers
% IP3 IM Gain A1 A2 B1 B2 1 0 0 -1 0.04 -0.875 0 -1 0
% IP1 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.02 -0.875 0 -1 0
% IP4 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.03 -0.6667 0 -1 0
% IP2 IM Gain A1 A2 B1 B2 1 0 0 -1 0.03 -0.6667 0 -1 0
```

Very good tracking performance
IP1: R_Pk= 5.805879e-002 p R_rms= 9.660890e-003 p
IP2: R_Pk= 6.869593e-002 p R_rms= 9.748086e-003 p
IP3: R_Pk= 5.469300e-002 p R_rms= 8.428640e-003 p
IP4: R_Pk= 5.093941e-002 p R_rms= 8.034136e-003 p

Dual Fringe tracking+ PRIMET (8kHz)

PACMA.2010-11-08T01:34:21.223.fits <-> PACMAN_OBS_GENERIC312_0006.fits: NOK Glitch (A-B)/650kHz, dOPDc offset 11.3 mm
Following files: OK, No glitch, fringe tracking on FSUA periodically lost followed by triangular fringe search
PACMA.2010-11-08T01:37:17.613.fits <-> PACMAN_OBS_GENERIC312_0007.fits (130sec) OK, ε= 65 μm/m
PACMA.2010-11-08T01:40:14.002.fits <-> PACMAN_OBS_GENERIC312_0008.fits (120sec) OK, ε= 66 μm/m
PACMA.2010-11-08T01:49:56.914.fits <-> PACMAN_OBJ_ASTRO_312_0001.fits (120sec) OK, ε= 66 μm/m
PACMA.2010-11-08T03:57:07.356.fits <-> PACMAN_OBJ_ASTRO_312_0005.fits (300sec) OK, ε= 64 μm/m
PACMA.2010-11-08T04:04:24.026.fits <-> PACMAN_OBJ_ASTRO_312_0006.fits (300sec at 2kHz) OK
PACMA.2010-11-08T04:21:06.365.fits <-> PACMAN_OBJ_ASTRO_312_0008.fits (300sec at 2kHz) OK

Fringe tracking FSUB, Fringe scanning FSUA with PRIMET

DL2= 55m (ref); DL4=22.9 going down

➔ Generic files recorded at 4kHz while PRIMET runs at 8kHz. This leads to periodical delay of +/- 1 sample at 4kHz

Sampling at 4kHz
PACMA.2010-11-08T02:06:07.131.fits <->PACMAN_OBS_GENERIC312_0011.fits, scan ? (SPRITE FILE),
OK, ΔL_Pk=800μm,period=8s->$V_{\Delta L}$=0.4mm/s, $A_{\Delta L}$~1m/s^2 (with peaks at 10m/s^2); , ε= 66 μm/m
PACMA.2010-11-08T02:11:08.521.fits <->PACMAN_OBS_GENERIC312_0012.fits, scan ?
NOK,ΔL_Pk=650μm, period=1s->$V_{\Delta L}$=2.6mm/s, Glitch A-B 200kHz (?) each scan
PACMA.2010-11-08T02:15:01.910.fits <->PACMAN_OBS_GENERIC312_0013.fits scan 400microns, 1s
NOK, ΔL_Pk~650μm , period=1s->$V_{\Delta L}$=2.6mm/s, Glitch A-B 200kHz (?) each scan
PACMA.2010-11-08T02:17:44.290.fits <->PACMAN_OBS_GENERIC312_0014.fits, scan 400microns, 2s
OK ΔL_Pk=765μm, period=2s->$V_{\Delta L}$~1.5mm/s
PACMA.2010-11-08T02:19:25.680.fits <->PACMAN_OBS_GENERIC312_0015.fits scan 400microns, 2s
OK ΔL_Pk=765μm, period=2s->$V_{\Delta L}$~1.5mm/s, (MinusB wraps only at the end: easy example)
PACMA.2010-11-08T03:43:48.685.fits <-> PACMAN_OBS_GENERIC312_0027.fits, scan 200microns, 1s
OK ΔL_Pk=366μm, period=1s->$V_{\Delta L}$~1.5mm/s , DL2=58m (ref) ; DL4=16m
PACMA.2010-11-08T03:46:30.075.fits <-> PACMAN_OBS_GENERIC312_0028.fits, scan 200microns, 1s
OK ΔL_Pk=366μm, period=1s->$V_{\Delta L}$~1.5mm/s, DL2=58m (ref) ; DL4=16m
Sampling at 8kHz
PACMA.2010-11-08T03:50:31.596.fits <->PACMAN_OBJ_ASTRO_312_0003.fits, scan 300microns,1.5s
OK ΔL_Pk=572μm, period=1.5s->$V_{\Delta L}$~1.5mm/s
PACMA.2010-11-08T03:53:25.706.fits <->PACMAN_OBJ_ASTRO_312_0004.fits, scan 300microns,1.5s
OK ΔL_Pk=572μm, period=1.5s->$V_{\Delta L}$~1.5mm/s (wraps only at beginning), , ε= 61 μm/m
PACMA.2010-11-08T04:30:17.035.fits <-> PACMAN_OBJ_ASTRO_312_0009.fits scan 300microns, 1.5s
OK, same as before but long file (250sec) New preset DL2=67m DL4=19m; , ε= 55 μm/m

Findings:

- , ε~ 60 μm/m always valid
- On 11-08T03:53:25 (similar on 11-08T01:49:56) but nothing on ***lprma2PhaseMeter2010-11-08T01.44.21.583802.txt***
- Periodical jumps of PRIMETB ~ 360-400 nm (not seen on Dl) alternatively every 0.5s and 0.7 sec
- Periodical jumps of DL every 2.5 sec by 1.45 microns…? (not seen on PRIMET
- ~Cyclic error primet: period=37.7097351629829e-006m amplitude=11nm. Can be slgihly seen on dl with much lower amplitude(but apparently same phase). Probably not polarization cross talk but linked to wooble of DL ? can it be seen on tr offset or full offset ?

Possible Origin of the drift :

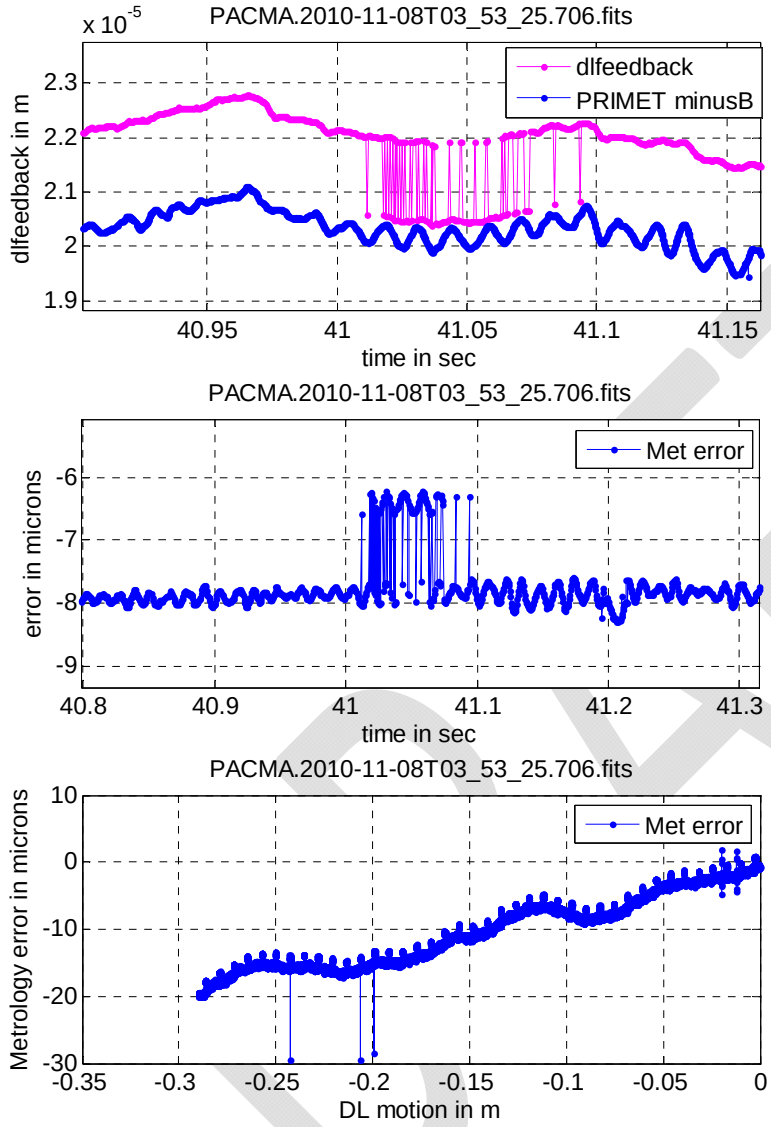
$\phi=2\pi/\lambda.n.D$
$dD/D=d\lambda/\lambda + d\phi/\phi+dndn$~60 μm/m (see above)
$d\phi/\phi$ =negligeable (phase meter electronic error)

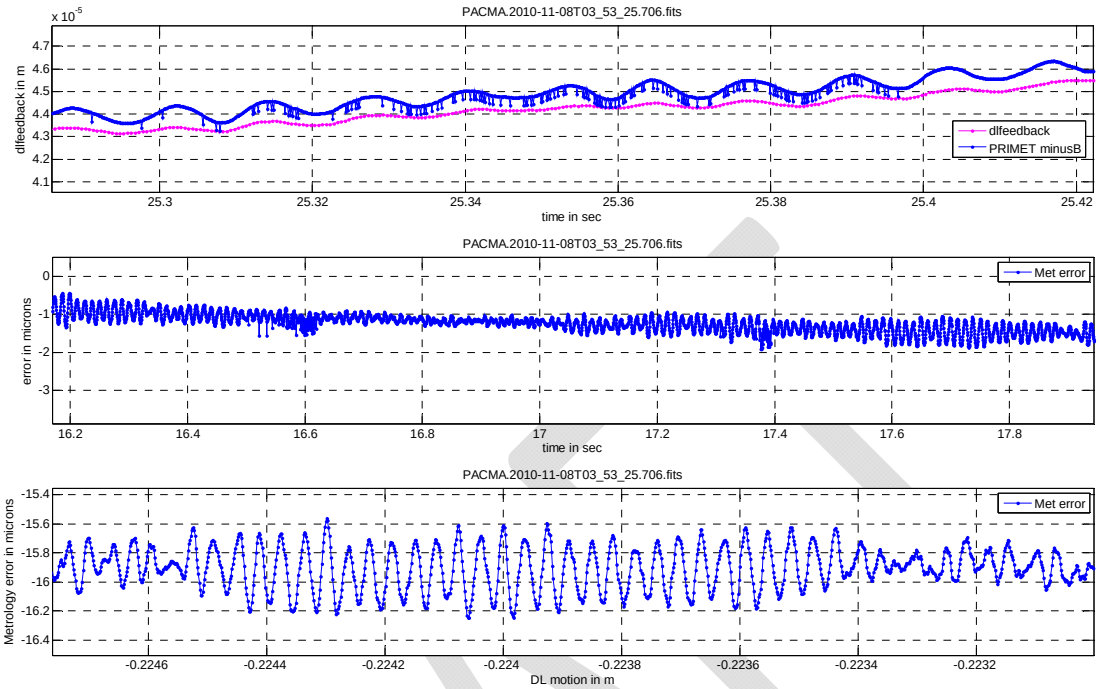
Effect of error on the laser wavelength (DL or PRIMET)

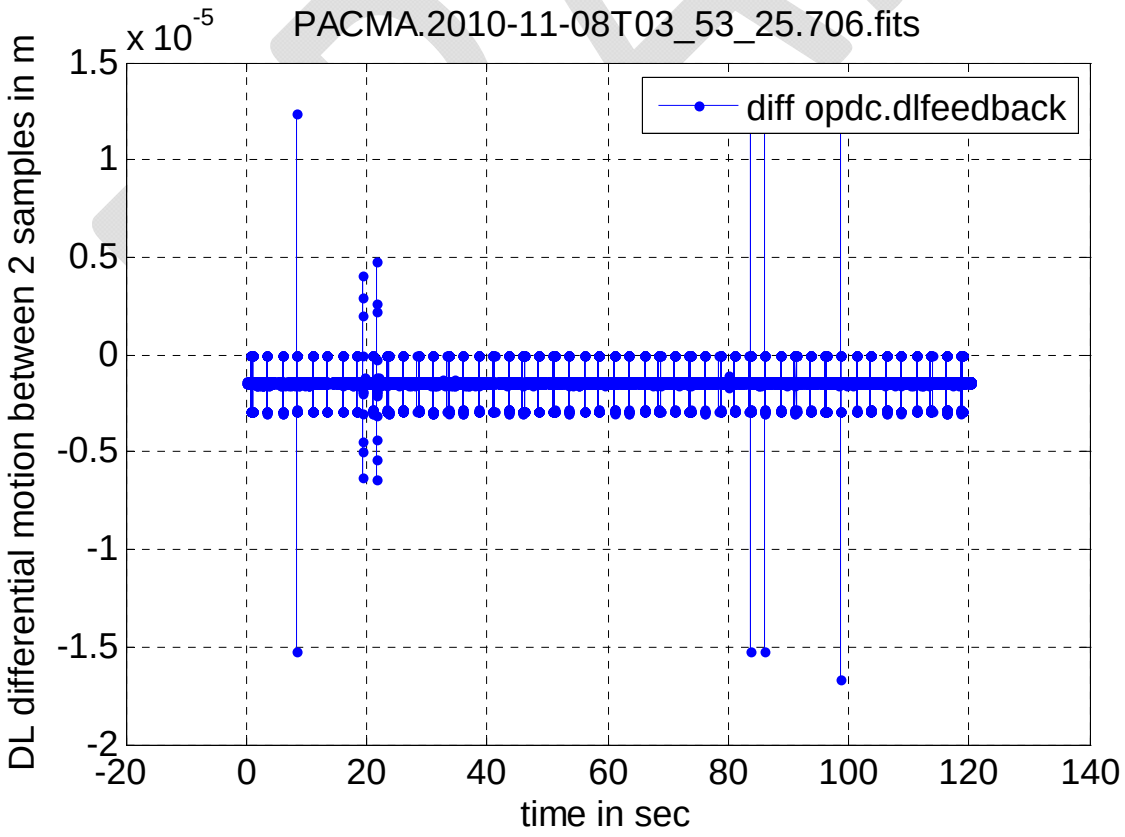
- ➔ Can be explained by $d\lambda_{DL}$=60 μm/m*633e-9=38 pm. Precision of λ_{DL} to be checked
- ➔ $d\lambda_{primet}/\lambda_{primet}$ known at better than 1.e-8: (corresponding to dD=10nm/m)
- ➔

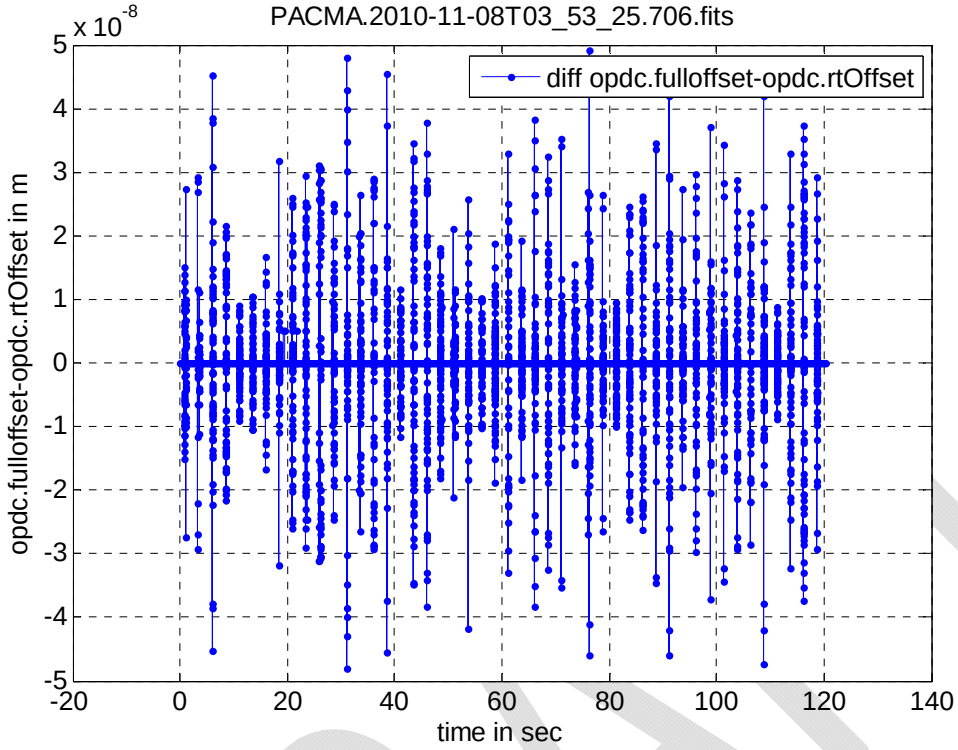
Effect of wrong index of refraction
(n_{DL}-1)*1.e6~202(standard P,T,H) [owens, 1967; used in SLE thesis p.93)
(n_{primet}-1)*1.e6~200 (standard P,T,H)

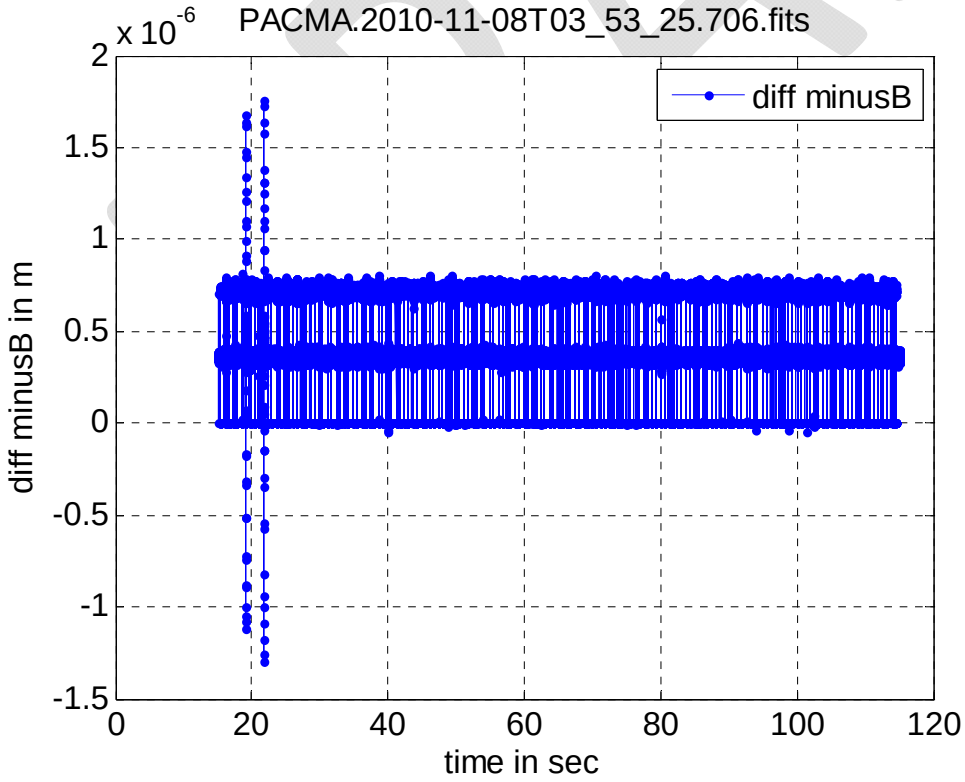
- ➔ If one uses n=1 instead of one of n_{DL} or n_{primet}: the error is ~ 200 μm/m
- ➔ The dispersion between n_{DL} or n_{primet} is ~(202-200)e-6 leading to an error of 2μm/m


x 10^-5
PACMA.2010-11-08T03_53_25.706.fits
dlfeedback
PRIMET minusB
dlfeedback in m
2.3
2.2
2.1
2
1.9
40.95
41
41.05
41.1
41.15
time in sec
PACMA.2010-11-08T03_53_25.706.fits
Met error
error in microns
-6
-7
-8
-9
40.8
40.9
41
41.1
41.2
41.3
time in sec
PACMA.2010-11-08T03_53_25.706.fits
Met error
Metrology error in microns
10
0
-10
-20
-30
-0.35
-0.3
-0.25
-0.2
-0.15
-0.1
-0.05
0
DL motion in m


PACMA.2010-11-08T03_53_25.706.fits
x 10^-5
dlfeedback in m
time in sec
dlfeedback
PRIMET minusB
PACMA.2010-11-08T03_53_25.706.fits
error in microns
time in sec
Met error
PACMA.2010-11-08T03_53_25.706.fits
Metrology error in microns
DL motion in m
Met error


PACMA.2010-11-08T03_53_25.706.fits
x 10^-5
DL differential motion between 2 samples in m
time in sec
diff opdc.dlfeedback


PACMA.2010-11-08T03_53_25.706.fits
x 10^-8
diff opdc.fulloffset-opdc.rtOffset
opdc.fulloffset-opdc.rtOffset in m
time in sec


PACMA.2010-11-08T03_53_25.706.fits
x 10^-6
diff minusB
diff minusB in m
time in sec

stop scanning/fringe tracking
Record quadcell file:

MetQuadCentroids2010T-11-08T04.36.09.034018.txt

```
% Parameters of the controllers
% IP3 IM Gain A1 A2 B1 B2 1 0 0 -1 0.04 -0.875 0 -1 0
% IP1 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.02 -0.875 0 -1 0
% IP4 IM Gain A1 A2 B1 B2 -1 0 0 -1 0.03 -0.6667 0 -1 0
% IP2 IM Gain A1 A2 B1 B2 1 0 0 -1 0.03 -0.6667 0 -1 0
```

IP1: R_Pk= 2.626553e-001 p R_rms= 1.559239e-002 p
IP2: R_Pk= 1.985875e-001 p R_rms= 1.577188e-002 p
IP3: R_Pk= 1.665787e-001 p R_rms= 1.881751e-002 p
IP4: R_Pk= 1.309240e-001 p R_rms= 1.490555e-002 p

➔ Degraded perfo due to single event, especially seen on IP1 and IP2 ? origin TBD

11 MO 8/11/10

11.1 Check DDL rate limiter and Robustness of PRIMET vs SETAPOS command

Procedure:
* select DDL2
* start with "standard" rate limiter 10000
* set DDL2 to zero
* start recording file at ddl level and at PRIMET level
* do SETAPOS
* stop recording

TAC report located in /vltdata/ENVIRONMENTS/lddl2/ddlDATA

$INTROOT/config/ddlCloseloop_lddl2.tac (e.g. for DDL 2)
TAC.BLOCK9.TYPE RateLimiter
TAC.BLOCK9.NAME ReferenceRLim
TAC.BLOCK9.PARAM 10000
INIT/ONLINE

Rate limiter 1000
SETAPOS 0-->10000
tacReport.1289250503.txt
SETAPOS 0-->10000
/tmp/kde-ddlmgr/ DDL2_rate1000.png
tacReport.1289251126.txt
-rw-rw-rw- 1 vx vlt 1015434 Nov 8 21:20 lprmacPhotodiodes2010-11-08T21.18.48.897052.txt
-rw-rw-rw- 1 vx vlt 2025270 Nov 8 21:20 lprmacPhaseMeter2010-11-08T21.18.48.897052.txt
==> Filename: lprmacPhaseMeter2010-11-08T21.18.48.897052.txt
Sampling frequency= 1000 Hz
Number of samples= 25000
Sampling= 1.000000e+003 Hz P_V Sampling= 1.000000e-005 sec
DeltaL Mean= 8.598362e-003 m
DeltaL PV= 2.010990e-002 m
DeltaL rms= 8.462967e-003 m
Status Not OK: 0
speed 2mm/sec with peak at 3.4 mm/sec

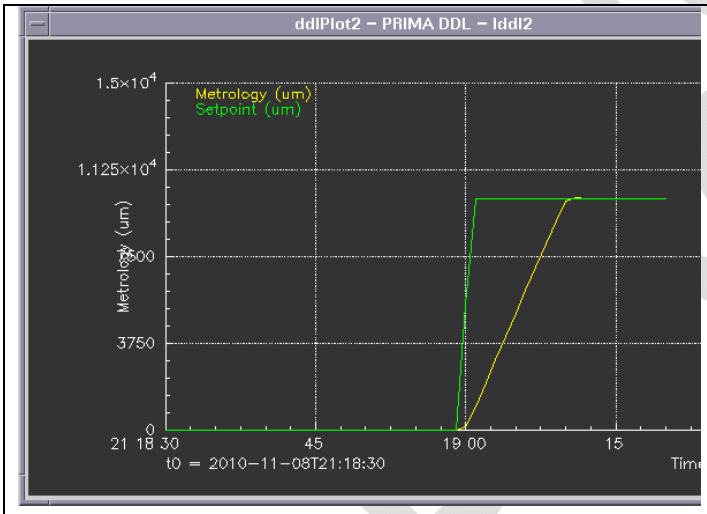
Phase Meter Data
==> Filename: lprma2PhaseMeter2010-11-08T21.18.48.899052.txt
Sampling frequency= 1000 Hz
Number of samples= 25000
Sampling= 1.000000e+003 Hz P_V Sampling= 9.000000e-006 sec
DeltaL Mean= 8.600694e-003 m
DeltaL PV= 2.011014e-002 m

DeltaL rms= 8.463243e-003 m
Status Not OK: 0

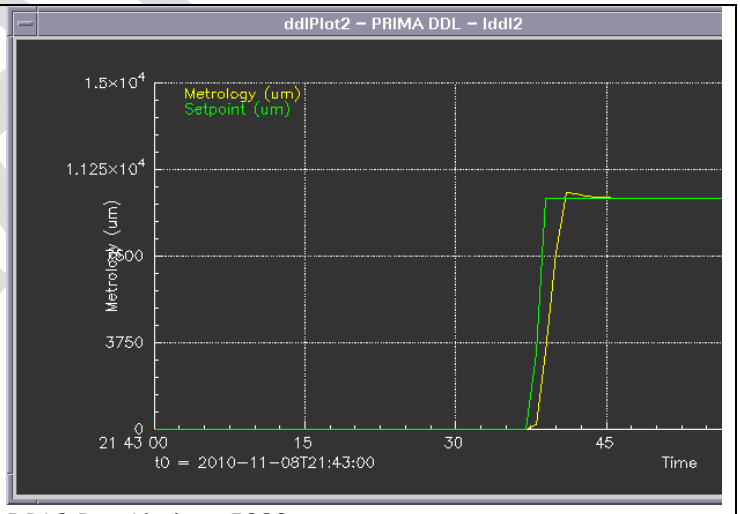
Rate limiter 5000

SETAPOS 0-->10000
/tmp/kde-ddlmgr/ DDL2_rate5000.png
-rw-rw-rw- 1 vx vlt 39870464 Nov 8 21:45 tacReport.1289252608.txt
-rw-rw-rw- 1 vx vlt 2053797 Nov 8 21:44 lprmacPhaseMeter2010-11-08T21.43.30.955052.txt

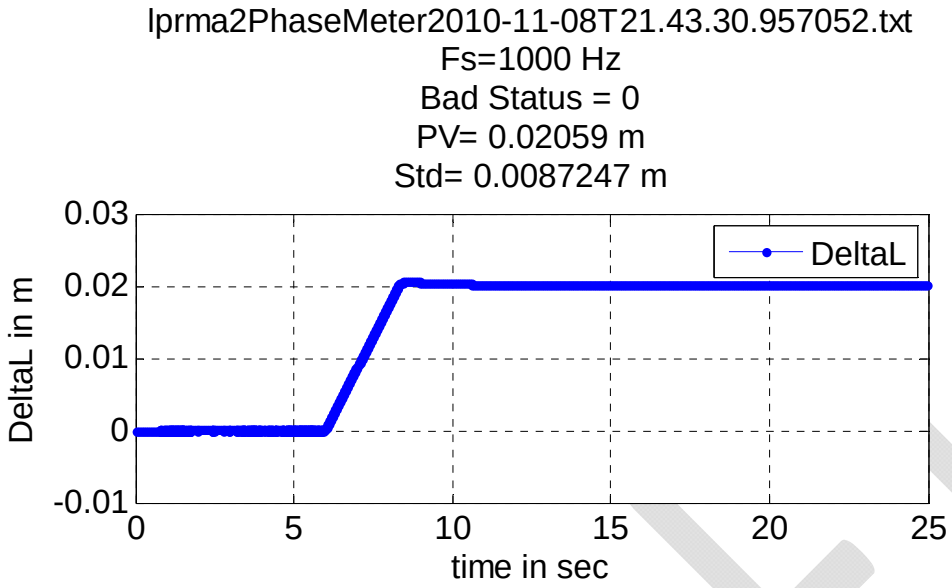
==> Filename: lprmacPhaseMeter2010-11-08T21.43.30.955052.txt
Sampling frequency= 1000 Hz
Number of samples= 25000
Sampling= 1.000000e+003 Hz P_V Sampling= 8.000000e-006 sec
DeltaL Mean= 1.436771e-002 m
DeltaL PV= 2.059513e-002 m
DeltaL rms= 8.727555e-003 m
Status Not OK: 0

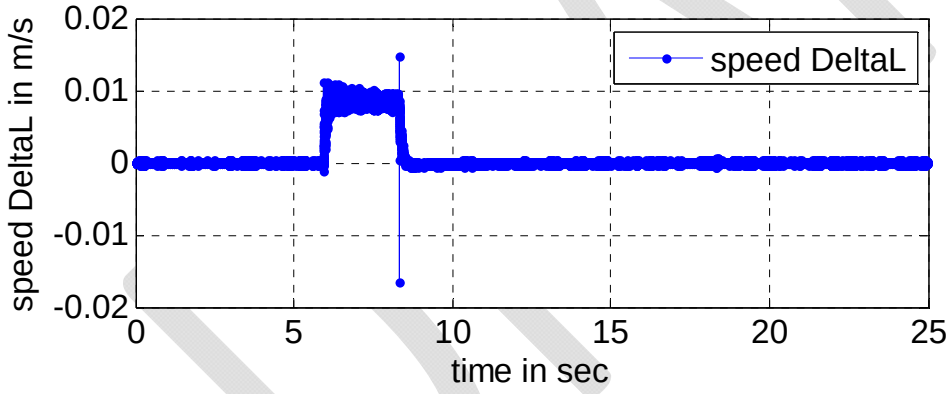


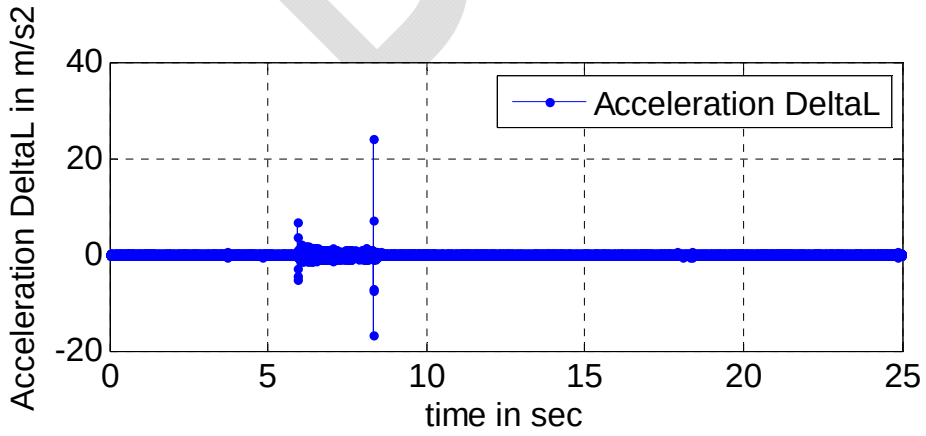
DDL2 RateLimiter=1000



DDL2 RateLimiter=5000


lprma2PhaseMeter2010-11-08T21.43.30.957052.txt
Fs=1000 Hz
Bad Status = 0
PV= 0.02059 m
Std= 0.0087247 m
DeltaL
DeltaL in m
time in sec


speed DeltaL
speed DeltaL in m/s
time in sec


Acceleration DeltaL
Acceleration DeltaL in m/s2
time in sec

- ➔ No quadcell data recorded
- ➔ No trace of periodical OPD jumps of ~400nm

11.2 Test Impact of new IRIS background on PRIMET

-> Test new Offset Background on IRIS implemented by Philippe and Andres : motion along W away from the edge of min[50pix, windowsize +xxxpixels].
50pix~7arcsec_sky
(note command GETBACKGROUND does not work, need to either do the background fully manually or use STARTLAG. if the fsm or iris are init after guiding for any reason, needs to clear the alignment offsets on IRIS side to avoid accumulation)

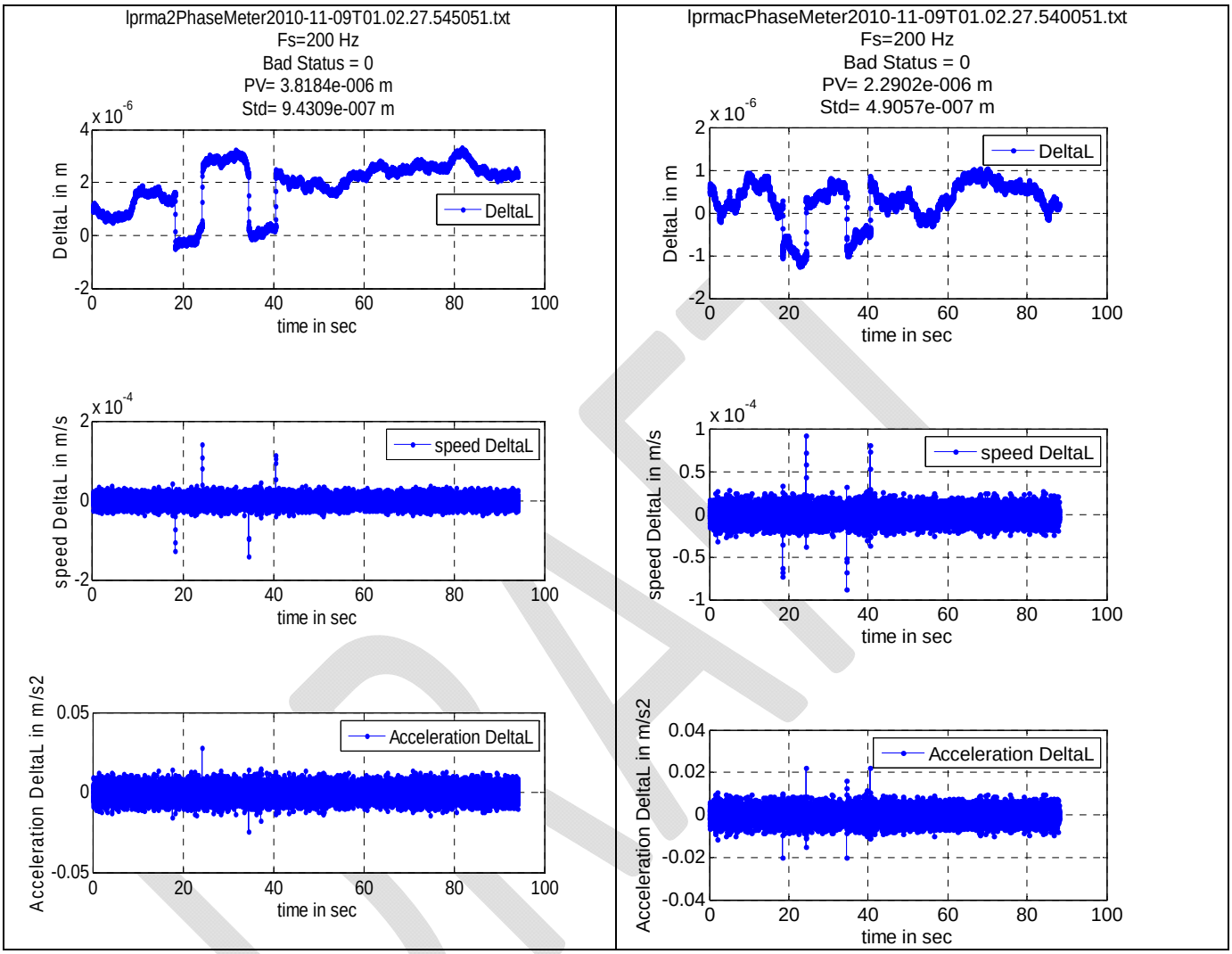
do STARTLAG with IRIS (2 backgrounds are taken):

First the telescopes are ignored by Antoine
-rw-rw-rw- 1 vx vlt 3415757 Nov 9 00:55 MetQuadCentroids2010-11-09T00.54.31.832019.txt
-rw-rw-rw- 1 vx vlt 290332 Nov 9 00:55 MetQuadCorrections2010-11-09T00.54.31.832019.txt
another file
-rw-rw-rw- 1 vx vlt 14630160 Nov 9 00:58 MetQuadCentroids2010-11-09T00.56.15.712019.txt
-rw-rw-rw- 1 vx vlt 1250292 Nov 9 00:58 MetQuadCorrections2010-11-09T00.56.15.712019.txt

Now with telescope un-ignored (should not make any difference since IRIS talks directly to fsm)
STARTLAG:
-rw-rw-rw- 1 vx vlt 14936271 Nov 9 01:04 MetQuadCentroids2010-11-09T01.02.29.072018.txt
-rw-rw-rw- 1 vx vlt 1274670 Nov 9 01:04 MetQuadCorrections2010-11-09T01.02.29.072018.txt

- ➔ On all files: IP1 and IP4 shows 2xhigh disturbance peak (~ 0.2 to 0.5).
  Ip1-AT2-beam A and IP4-AT4-BeamB: need to check the beams for which the background was taken. Cross check effect of fsm step change on quadcell signals

- ➔ No effect on IP2 and Ip3


lprma2PhaseMeter2010-11-09T01.02.27.545051.txt
Fs=200 Hz
Bad Status = 0
PV= 3.8184e-006 m
Std= 9.4309e-007 m
x 10^-6
DeltaL in m
DeltaL
time in sec
x 10^-4
speed DeltaL in m/s
speed DeltaL
time in sec
Acceleration DeltaL in m/s2
Acceleration DeltaL
time in sec
lprmacPhaseMeter2010-11-09T01.02.27.540051.txt
Fs=200 Hz
Bad Status = 0
PV= 2.2902e-006 m
Std= 4.9057e-007 m
x 10^-6
DeltaL in m
DeltaL
time in sec
x 10^-4
speed DeltaL in m/s
speed DeltaL
time in sec
Acceleration DeltaL in m/s2
Acceleration DeltaL
time in sec

OK No glitch

11.3 Dual fringe tracking and scan data

1h55 dual FTK file

27 PACMA.2010-11-09T04:54:20.068.fits <-> PACMAN_OBJ_ASTRO_313_0015.fits
28 PACMA.2010-11-09T04:59:10.738.fits <-> PACMAN_OBJ_ASTRO_313_0016.fits

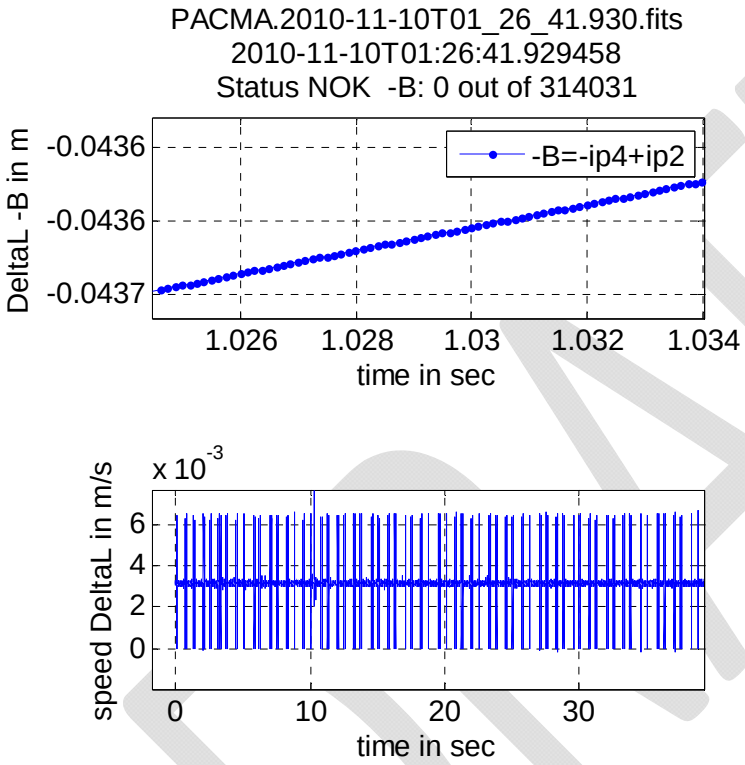
2h04 scanning file

29 PACMA.2010-11-09T05:04:27.418.fits <-> PACMAN_OBJ_ASTRO_313_0017.fits
30 PACMA.2010-11-09T05:09:18.088.fits <-> PACMAN_OBJ_ASTRO_313_0018.fits

12 TU 9/11

Swap DDL only with ratelimiter=2000
1 PACMA.2010-11-10T01:26:41.930.fits <-> PACMAN_OBJ_ASTRO_314_0001.fits

- **Taken at 8 kHz**
- **Swap DDL1/DDL2 only moves A-B by 60 microns ; -B jump of half, OK**
- **Periodical behavior on speed of minusB**



Swap/unswap with DDL only with rate limiter 2000
2 PACMA.2010-11-10T04:04:58.819.fits <-> PACMAN_OBJ_ASTRO_314_0002.fits
->recorded at 200Hz only, zeros at the end of the file

Swap with DDL with rate limiter 2000 and swap Telescopes.
3 PACMA.2010-11-10T04:07:34.459.fits <-> PACMAN_OBJ_ASTRO_314_0003.fits
->recorded at 200Hz only, zeros at the end of the file

13 FRI 12/11/10

FILE	FWHM END	TAU0 END	FT SENSOR	AIRM END
PACMA.2010-11-13T03:13:14.352.fits PACMAN_OBJ_ASTRO_317_0002.fits	0.94	0.002073	FSUB	1.177
scan amplitude: 160e-6, scan period 2, offset 0.0029				
PACMA.2010-11-13T03:37:38.591.fits PACMAN_OBJ_ASTRO_317_0006.fits	1.27	0.001548	FSUB	1.189
scan amplitude: 160e-6, scan period 2, offset 0.0033				
PACMA.2010-11-13T03:50:06.931.fits PACMAN_OBJ_ASTRO_317_0008.fits	1.47	0.001350	FSUB	1.198
scan amplitude: 160e-6, scan period 2, offset 0.00345, focus adjust during the file				
PACMA.2010-11-13T03:55:58.601.fits PACMAN_OBJ_ASTRO_317_0009.fits	1.36	0.001466	FSUB	1.203
scan amplitude: 160e-6, scan period 2, offset 0.00365				
PACMA.2010-11-13T04:02:00.271.fits PACMAN_OBJ_ASTRO_317_0010.fits	1.56	0.001278	FSUB	1.209
scan amplitude: 160e-6, scan period 2, offset 0.00365				
PACMA.2010-11-13T04:10:25.770.fits PACMAN_OBJ_ASTRO_317_0011.fits	1.45	0.001379	FSUB	1.218
scan amplitude: 160e-6, scan period 2, offset 0.00375				
PACMA.2010-11-13T04:16:11.261.fits PACMAN_OBJ_ASTRO_317_0012.fits	1.13	0.001788	FSUB	1.225
scan amplitude: 160e-6, scan period 2, offset 0.00375				
PACMA.2010-11-13T04:41:01.760.fits PACMAN_OBJ_ASTRO_317_0016.fits	0.92	0.002213	FSUB	1.261
PACMA.2010-11-13T04:47:33.429.fits PACMAN_OBJ_ASTRO_317_0017.fits	1.21	0.001696	FSUB	1.273
scan amplitude: 160e-6, scan period 2, offset 0.0043				

Other files

00h22 taking scanning file: OBJ_ASTRO_317_0003, scan amplitude: 160e-6, scan period 2, offset 0.0029
00h27 taking scanning file: OBJ_ASTRO_317_0004/5, scan amplitude: 160e-6, scan period 2, offset 0.0031,
00h40 taking scanning file: OBJ_ASTRO_317_0006/7, scan amplitude: 160e-6, scan period 2, offset 0.0033
01h08 preset DL, reset PRIMET
01h26 taking scanning file: OBJ_ASTRO_317_0013/14/15, scan amplitude: 160e-6, scan period 2, offset 0.004
01h47 taking scanning file: OBJ_ASTRO_317_0017/18, scan amplitude: 160e-6, scan period 2, offset 0.0043
01h58 taking scanning file: OBJ_ASTRO_317_001920/21/22, scan amplitude: 160e-6, scan period 2, offset 0.0045

14 PRIMET SCRIPTS

14.1 Osf Scripts available during Com13 on wprima

14.1.1 OSF PREPARE_PRIMET_LABCAL

Objective: set PRIMET for FSU lab calibration
Preconditions: none
Steps:
Postconditions:
PMCS is in state stable
PRIMET ready for lab calibration

[recommended to use this script even if a calibration is done at the end of the night.
It is not compulsory but safer, just in case fs has changed or after any weird configuration of PRIMET during the night]

14.1.2 OSF TEST_PRIMET_MARCEL

Objective: Engineering test of PRIMET using Marcel
Preconditions: Marcel bs mirrors set in AUTOTEST [human intervention using waral/aripanControl]
Steps:
Postconditions:

14.1.3 OSF PREPARE_PRIMET_STS

Objective: Engineering test of PRIMET using the STS/VLTI during day-time
Preconditions: VLTI set-up correctly
1/ Set-up manually all relevant systems ONLINE:
Option1: DLCS-> set all relevant systems online from dlguiStatus (set manually ignored sub-systems)
Dl2/DL4 VCm2/VCM4/Manathan/FINITO/ etc…
ARAL-> from aropanControl (to configure the lab later on with ISS Observer Main->lab
DDL-> from ddlguiStatus
PRICS->from priguistatus
AT-> from atguistatus (to get fsm/vcm online
(What about M16 ?

Option 2:

* perform “truncated” VLTI start-up: wvgvlti->Left mouse click->Startup
  - -> *launch Delay Lines (DLCS) and select the proper DL configuration:* The only step that can be skipped is: ->prepare for observation->FINITO. However, start FINITO must be done to get FNT online (and therefore dlcs). This takes time because it inits tranlation stages. Includes preset to fake coordinate which will put Dl-VCM in tracking.
  - -> launch ARAL [would this kill IRIS for example and restart it ?]

2/ CONFIGURE:
* set ISS Observer State ONLINE
    o Telescopes ignored
    o Common: DLCS, ARAL, DDL ,NOT ignored; RMASS and RMNREC ignored
    o ISS: all NOT ignored
    o PRIMA: all NOT ignored [NEED TO HAVE ALL SYSTEM ONLINE on priGuiStatus]
3/ * (ISS) ARRAY CONFIGURATION:Expert Mode->feed Mode=PRIMA_DUAL-> Configure proper PRIMA config (AT3-STS,AT4-STS,input 1,3,Comp diff)
4/ * ISS Observer Main: lab-> Mirror Configuration=PACMAN (no switchyard config) ->Configure
5/ * STS fsm/vcm online, init standby, online done to remove any offset; add fsm alignment offsets W=+100(A)/-100(B)
6/…* DL-VCM preset/tracking ; vcmwsgui-> preset tracking is only done after first preset of DL.
(to be done manually if a preset of DL has not been done before as in option1)
To be added on precondition warning of the script

Steps:
* set all PRIMET LCU online
* set laser ON, start frequency stabilization with the largest LSP=5 V
* Query the telescopes configuration for lprmpd
* Query the quadcell gains PGA/TRA (IP1=IP3 A beams and Ip2=ip4 B beams) or use default
* Beam search (default threshold)
* STRTMPO all
* STARTMET A-B and –B----------No LMOT motion/No file recorded

14.1.4 OSF PRIMET_Day-to-Night and Night-to-Day

Objective: safely configure PRIMET for night observation
Preconditions:
(to be shown at the beginning with a pop-up- window)
“ Please Check the Preconditions for PRIMET DAY-to-Night
-VLTI start-up done by the VLTI manager
-ISS Array Configuration: Valid PRIMA configuration and PRIMA_DUAL selected (expert mode)
-ISS Observer Main: Lab->PACMAN (Switchyard config=Switchyard config)
-Interlock Armed after the inspection of the Laser Controlled Areas (in coordination with the VLTI manager) “

- This leads to : 1/ fsm are online but pointing the edge
  2/ 1xDL “test” preset done during DLCS start-up: the DL-VCM curvature is tracked

Steps:
- kill all Primet panels (inc. trd scopes etc...)
then the following steps are taken from Prepare_primet_sts.osf
- Prepare_primet_sts : Software configure
- Prepare_primet_sts : PRICSStart
- Prepare_primet_sts : Command ONLINE PRIMET LCUs and PMCS
- Prepare_primet_sts : Telescope configuration [→query: can it be avoided with script at iss level ?]
- Prepare_primet_sts : Start LASER
- Prepare_primet_sts : Preset FSU-A and FSU-B ACU's
  but ACU and LMOT are set by default to SCIENTIFIC (no user query)
- Prepare_primet_sts : Pupil Position Optimization (guiding)
  but only set all gains to default (no user query),
  do not STRTMPO
- Prepare_primet_sts : Command PMCS to ONLINE-Stable

Postconditions:
PMCS in state ONLINE-STABLE

- we don't go further, no attempt to close the pupil tracking loop or STRTMET because the fsm are pointing the edge; Need first PRIMA preset

It is assumed that it will be all set when the template will need PRIMET

(TBC: fs=8kHz defined in the script)

PRIMET_Night_to_Day:
Objective: safely terminate the use of PRIMET
Preconditions: PRIMET in any configuration
Steps
- STOPMET
- STOPMPO ALL
- STOP Laser frequency stabilization
- Switch laser Standby
- Disarm Interlock
- put all primet processes Standby (pmcs, pmlss,pmpsd,pmacq)
- kill all PRIMET panels

Postconditions:
All PRIMET sub-systems and pmcs in Standby
Laser OFF and interlock dismarmed.

14.2 Scripts required for COM14

14.2.1 Migration of the osf PRIMET-day-to-night as part of the PRIMA-day-to-night and PRIMA_nigth_to_day:

In order to build a PRIMA start-up script at ISS level, the steps related to PRIMET are defined below

DAY-TO-NIGHT
Objective: safely start-up PRIMET (Day-to-night)

Preconditions:

- Interlock Armed after the inspection of the Laser Controlled Areas (in coordination with the VLTI manager)
- VLTI manager knows the Array,Lab,and Instrument configurations for the night

Sequence
---
option 1: call priosfPRIMET_DAY_TO_NIGHT.osf on wprima

In that case, a pop-up menu recalls the pre-conditions.
The script will query the telescope configuration, so the VLTI manager will have to enter it again .

To avoid this, another option could be used

option 2:
"copy" all steps of priosfPRIMET_DAY_TO_NIGHT.osf in a script running on ISS, but
1/Remove the query of the telescope configuration and directly set it using the public command SETMCONF, once the telescope configuration has been entered by VLTI manager in an earlier step of the VLTI start-up.
2/also, the step Preset FSUA/B ACU (to scientific) could be removed and done at the level of the start-up of the FSU's

Postconditions:

-PMCS in state ONLINE-STABLE
At this point, we don't go further (i.e. no attempt to close the pupil tracking loop or STRTMET).

NIGHT-TO-DAY
Objective: safely terminate the use of PRIMET

Preconditions: none

Sequence:
---

call priosfPRIMET_DAY_TO_NIGHT.osf on wprima
Postconditions:

All PRIMET processes in Standby
Laser OFF and interlock dismarmed.

14.2.2 PRIMET engineering test based on a simulated PRIMA observation during day-time

Script:

Objectives and main description

- Check and characterize the behavior/health of PRIMET in conditions representative of a PRIMA observation.
- PRIMET is operated up to the 2xAT-STS , through the laboratory optical path (including the FSU ACU's), the DDL and DL. Various PRIMA operational transitions are exercised to check the metrology robustness.

Preconditions:

- Interlock Armed after the inspection of the Laser Controlled Areas (in coordination with the VLTI manager)
- The hardware configuration of the Array (i.e. AT-STS, M12-DL) is a PRIMA configuration compatible with the test

Sequence

1/ Configuration:

- Run "VLTI start-up":
  - *Step 1* (DLCS): using the desired DL configuration; [note: ->prepare for observation->FINITO can be skipped].
  - *Step 2* (ARAL): [Note: IRIS is not needed; only need the lab configuration, aripanControl like]
  - For ATCS (2xAT-STS): [different from step3 of the start-up->new script needed:call new AT osf ?]
    - All VCMs are set ONLINE; All FSM are set ONLINE and then to the alignment offsets W=+100 (A-beams) and W=-100 (B-beams)
    - TBC: shut down air conditioning (but maintain cooling of the Nodules); Close back ROS-shutter ;
    - All other AT-STS sub-systems are not needed.
  - FOR PRIMA (including DDL): [new script needed]:
    - run either Day-to-nights of PRIMET/FSU/DDL [ISS script if ready, if not osf on WPRIMA and WDDL ; SET DDL&DOPDc Online and PRICS Online.
    - Note: for the FSU's: Only the pfttp/pftst modules are needed (pfcs,pfdet can be ignored) . The ACU's/TST must be set in SCIENTIFIC mode
- Run Instrument Start-up for PACMAN (TBC how and when)
- Set ISS Observer State ONLINE (issguiObsStatus on wvgvlti)
  - Telescopes ignored
  - Common: [DLCS, ARAL, DDL]=NOT ignored; [RMASS , RMNREC]=NOT ignored (TBC)
  - ISS: all NOT ignored
  - PRIMA: all NOT ignored
- Configure the ARRAY (issguiConfig on wvgvlti)

- (ISS) ARRAY CONFIGURATION: Expert Mode->feed Mode=PRIMA_DUAL-> Configure proper PRIMA config (AT3-STS,AT4-STS,input 1,3,Comp diff)

- Configure the LAB (issguiObsMain on wvgvlti):
  - ISS Observer Main : lab-> Mirror Configuration=PACMAN (no switchyard config) ->Configure

2/ PRESET sequence (Telescope ignored)

- pssguiSetup on wvgvlti
  - Coordinates:
    - Primary Star: RA=get current Sideral time; DEC=-243730 (=zenith UT3 or site latitude=-243740)
    - Secondary Star: RA= get current Sideral time;DEC=Primary+30arcsec (B=100m-> ΔL~30mm).
  - Guiding/Chopping: no entry (AT-STS ignored)
  - Delay Line: Select reference DL (e.g. DL2); Reference OPL=0m;sensor=FSUB;Mode=Auto
  - Differential Delay Line: default sensor=FSUA; swap sensor=FSUB
  - Fringe sensor Unit: no entry
  - [cross check that the telescopes are ignored in issguiObsStatus] and CLRSTP and PRESET
  - -> the DL and DDL are blind tracking

Question: how is the remaining tracking time set ?

3/ Test sequence and Data Recording

- Preconditions: PRESET done, DL and DDL blind tracking [TBC if
- PACMAN-> Bob-> New Engineering template
  - STRTMPO
  - STRTMET
  - Start Recording

  - Start OPDc “simple scan”: parameters [ZPDoffset, Scan Amplitude, Scan Period] ; Default [2.5e-2,5e-2,1000]-> this leads to v=5e-2/(1000/4)=200microns/sec (all mechanical values)
  - Wait T1 seconds (default 10 sec)
  - Stop OPDc “simple scan”
  - Start OPDc fringe tracking(GroupDelay) : parameters [ZPDoffset, ZPD Amplitude, ZPD Period,Detection Level]; defaults [0, 100e-6, 20,200] (high detection level to “never” detect fringes” [→ TBC: does pfdet need to be ONLINE? Or grab any value on the rmn]
  - Wait T1 seconds (default 10 sec)
  - Stop OPDc fringe tracking
  - Wait T2 seconds (default 5 sec)

  - Start ddOPDc “simple scan”: parameters [ZPDoffset, Scan Amplitude, Scan Period] ; Default [2.5e-3,5e-3,100]-> this leads to v=200microns/sec (all mechanical values)
  - Wait T1 seconds (default 10 sec)
  - Stop ddOPDc “simple scan”

- Start dOPDc fringe tracking(GroupDelay) : parameters [ZPDoffset, ZPD Amplitude, ZPD Period,Detection Level]; defaults [0, 100e-6, 20,200] (high detection level to "never" detect fringes"
- Wait T1 seconds (default 10 sec)
- Stop ddOPDc fringe tracking
- Wait T2 seconds (default 5 sec)
- SWAP
- Wait T1 seconds (default 10 sec)
- UNSWAP
- Wait T1 seconds (default 10 sec)
- STOP RECORDING
- STOPMET

4/ Stop observation/clean-up the system including proper transition to stand-by
(to be filled)

Postconditions:

- Data files collected
- VLTI ready for any other day-time test

15 PERSPECTIVES FOR COM14

Prerequisites for PRIMET

- Com14: need new public command to call SETFSEN. DL should never be represet within astro template
- Com14: need DL rate limiter
- Com14: keep memory of offsets (PACMAN OPD offset ?) to start fringe search with opdc/dopdc around zero offset.
- Com14: solve FSM jumps during swap; define forbidden zones
- Com14: solve DDL self-reboot

Identification	*P1 PRIMET setup for COM14 (day-time)*
Priority(high,medium,low)	high
Duration	1d
Responsible	S.Leveque
Description	Setup PRIMET for COM14
Prerequisite/Predecessor	DDL aligned (PHA) MARCEL checked (PHA)
Input	
Output	
Criteria for Completion	PRIMET operates during day-time on 2xSTS
Successor	*P2 tuning of DL and DDL rate limiter (day-time)*
Manpower Required	SLE
Facility /Tooling Required	Whole VLTI
Sequence /procedure(incl. ref doc)	Define pupil re-imaging offset for DL4 if not already done Define FSUA/B ACU Autocoll position if not already done Configure VLTI (manually or run truncated VLTI start-up) Start-up DDL, FSU-autotest, PRIMET (use individual osf scripts) Put STS FSM/VCM Online with fsm offset at W=+/-100 start PMCS-> attempt to put PMCS in recording if strtMPO fails-> go to pmpsdgui and try to get the beams manually (worst case go to the lab to check for the returning beams) assess VCM position setpoints and compare to previous COMs move DDL with *SETAPOS* and monitor PRIMET behaviour move DL with *dltestTrack* monitor PRIMET behaviour for various DL starting positions. Assess robustness. dltestTrack <ldlnumber> <startOPL> <speed in mm/s> dltestPresetDL_VCM <dl> <opl> [<pupil offset of Pupil Out>]

Identification	*P2 tuning of DL and DDL rate limiter (day-time)*
Priority(high,medium,low)	high
Duration	1d
Responsible	S.Leveque
Description	
Prerequisite/Predecessor	*P1 PRIMET setup for COM14*
Input	
Output	
Criteria for Completion	No glitch for (d)OPDc offsets of ~ several cm (typ 3 cm)
Successor	
Manpower Required	SLE, NDI
Facility /Tooling Required	Whole VLTI
Sequence /procedure(incl. ref doc)	Follow the set-up sequence and day-time "preset" (see section 14.2.2) Put STS FSM/VCM Online with fsm offset at W=+/-100 (DL and DDL are in blind tacking) Initial tests with Beam profiler while offsetting/swapping DL/DDL Then Use the new pacman template for PRIMETday-time test. If not available, follow the steps described in section 14.2.2 <u>Test of DL rate/acceleration limiters (</u> Default value for DL rate/acceleration limiters: • Maximum Acceleration, default 0.01 (10 mm/s2) • Maximum Velocity, default 0.001 (1 mm/s) [CHECK ORIGIN!] • Linger threshold, default 50e-6 • Linger timeout, default 10 o STRTMPO o STRTMET o Start Recording (engineering file if the template is not used) o Start OPDc "simple scan": parameters [ZPDoffset, Scan Amplitude, Scan Period] ; Default [2.5e-2,5e-2,1000] -> this leads to v=5e-2/(1000/4)=200microns/sec (all mechanical values) o Wait T1 seconds (default 10 sec) o Stop OPDc "simple scan" o Start OPDc fringe tracking(GroupDelay) : parameters [ZPDoffset, ZPD Amplitude, ZPD Period,Detection Level]; defaults [0, 100e-6, 20,200] (high detection level to "never" detect fringes" [→ TBC: does pfdet need to be ONLINE? Or grab any value on the rmn] o Wait T1 seconds (default 10 sec) o Stop OPDc fringe tracking o Wait T2 seconds (default 5 sec) o Stop recording Assess the behavior/robustness of PRIMET for various combinations of (ZPDoffsets,rate/acceleration limits) Com13: ZPDoffsets>1mm lead to glitches ZPDoffset=2.5 cm -> define associated rate/acceleration limits if need be ZPDoffset=1cm -> define associated rate/acceleration limits if need be <u>Test of DDL rate/acceleration limiters</u> Default value for DDL rate/acceleration limiters:

	• Maximum Acceleration, default ?? (?? mm/s2) • Maximum Velocity, default 0??? (?? mm/s) • Linger threshold, default ???? (TBC if needed) • Linger timeout, default ???? (TBC if needed) o Start recording o Start ddOPDc "simple scan": parameters [ZPDoffset, Scan Amplitude, Scan Period] ; Default [2.5e-3,5e-3,100]-> this leads to v=200microns/sec (all mechanical values) o Wait T1 seconds (default 10 sec) o Stop ddOPDc "simple scan" o Start ddOPDc fringe tracking(GroupDelay) : parameters [ZPDoffset, ZPD Amplitude, ZPD Period,Detection Level]; defaults [0, 100e-6, 20,200] (high detection level to "never" detect fringes" o Wait T1 seconds (default 10 sec) o Stop ddOPDc fringe tracking o Stop recording Test of DDL swap o Set the proper DI/DDL rate acceleration limits; Check that the telescopes are ignored o Start recording o Wait T2 seconds (default 5 sec) o SWAP (from pssguiSetup on wvgvlti) o Wait T1 seconds (default 10 sec) o UNSWAP o Wait T1 seconds (default 10 sec) o Stop recording Com13: ZPDoffsets>1mm lead to glitches dopdc :ZPDoffsets=7mm(mech) OK;14mm(mech) OK;20mm (mech) NOK, but 200kH error opdc : ZPDoffsets=1mm OK;NOK Conditions tested during COM13; DLBlind tracking DL2=93m (ref.); DL4=20m (blind tracking, going down) Simple scan of DL4 (added to blind trajectory), amplitude=0.01 period=200 (DDL1 in blind tracking)

Identification	*P3 test of the new observation template with PRIMET*
Priority(high,medium,low)	high
Duration	0.5 d
Responsible	S.Leveque
Description	Check that the new observation template (dark/flat with offsguv; automatic fringe scan, etc…) calls properly PRIMET.
Prerequisite/Predecessor	*P2 tuning of DL and DDL rate limiter (day-time)*
Input	
Output	Description of any functionality problems And possible solutions
Criteria for Completion	Functional testing completed.
Successor	
Manpower Required	SLE, AME,AMU

Facility /Tooling Required	Whole VLTI
Sequence /procedure(incl. ref doc)	Prepare for PRIMA observation. Second half of the night Known Targets for which fringes were detected and tracked. Scroll through all steps of the PRIMA observing sequence (using the new template) and monitor the behaviour of PRIMET. Disantangle between problems linked with public commands and functional problem of PRIMET w.r.t PRIMA stimuli (see next task)

Identification	*P4 PRIMET Functional testing and* compatibility to all PRIMA stimuli
Priority(high,medium,low)	high
Duration	3 d
Responsible	S.Leveque
Description	re-assess PRIMET compatibility to all PRIMA stimuli: - IRIS background - FSU dark/flat calibration using telescope DL/DDL fringe scan - DL/DDL fringe search with a given OPL offset - PRIMA swap - BTK/IFG
Prerequisite/Predecessor	*P3 test of the new observation template with PRIMET*
Input	
Output	Description of any functionality problems And possible solutions
Criteria for Completion	Functional testing completed.
Successor	
Manpower Required	SLE, AME,AMU
Facility /Tooling Required	Whole VLTI
Sequence /procedure(incl. ref doc)	Prepare for PRIMA observation. Second half of the night Known Targets for which fringes were detected and tracked. Scroll through all steps of the PRIMA observing sequence (using the new template) and monitor the behaviour of PRIMET. For each, stimuli, record files (engineering and/or PACMAN files) - IRIS background - FSU dark/flat calibration using telescope offsets - ->check for fsm drifts) - DL/DDL fringe scan - DL/DDL fringe search with a given OPL offset - PRIMA swap - (check for unwanted DL/DDL/fsm motions; check DL-VCM Example for testing the Impact of IFG (or BTK) - Set PRIMET rate to 8kHz ; - start Recording Generic (with ACU pos); wait 15 sec - switch ON IFG (or BTK); wait 15 sec - switch OFF IFG (or BTK) ; wait 15 sec - stop recording generic - stop recording PRIMET engineering files

Identification	*P5 PRIMET performance testing*
Priority(high,medium,low)	high
Duration	4 d
Responsible	S.Leveque
Description	
Prerequisite/Predecessor	*P4 PRIMET Functional testing and* compatibility to all PRIMA stimuli
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	SLE,AME,JSA
Facility /Tooling Required	Whole VLTI
Sequence /procedure(incl. ref doc)	*PRIMET Performance evaluation* - Check fringe tracking perfo for DL/DDL rate limiter selected for PRIMET - Opd due to polarization cross-talk - Sensitivity fsm offsets/OPL: how to improve it - Check problem of beam wandering during day-time - Assess PRIMET OPD jumps - Measure flux crosstalk on the quadcells o prepare for pupil tracking on all 4 beams o set fsm with an offset of W=+/-100 o center the beams manually with VCM alignment offset's or update the VCM origins (to avoid jumps when closing/opening the tracking loop) o pupil track on all IP's (or at least on IP2 & IP4) o start recording engineering file o wait 10 sec o stop pupil tracking in IP2 and set AOM IP2=0 o wait 10sec, set AOM IP2=100 o STRTMPO on IP2 only o Repeat the procedure for IP4 and Ip1 and IP3 o Repeat the whole procedure with different fsm alignment offsets: W=+/-50; W=+/- 25;W=+/- 0 (on edge) *PRIMET engineering tests/maintenance scripts/templates:* - Definition of the tests/templates (osf/iss): how to handle fsm and potentially AT air conditioning - start-up/shut-down at ISS level (include verification that the beacons can be seen on IRIS) - day-time script using PACMAN template (fake observation) - Script test PRIMET BTK - Definition of the criteria for completion and quality control: OK/NOK. *Training on PRIMET operation* *Simplify or improve Metrology panels with parEng and parSciops (especially PMCS panel)* *Review the need for a new PRIMA Gui with simplified information/ public commands* *Collect all necessary information to update PRIMET docs*

Old comments (to be updated)

* Check impact of DL fringe scan and fringe search using OPDc (results of COM12)
    - o test transition from blind/_ -> blind/scan with an offset->blind/_
    - o test transition from blind/_-> fringe search with an offset->blind/_.

Currently the offset limitation seems to be ~ 1mm without DL rate limiter.
This also applies for the max jump in the fringe search

- o test transition search->track->search (need disturbance file during day time ?)
- o test transition track-> blind:

There should be a jump:

1/ scan offset (if it was not fed to the blind trajectory). This can be several cm depending on the OPD model)

2/ the search offset (which should be small)

- o (is the fringe scan with DL included in the template ? if not, will not appear after swap only if the blind traj. has been updated. Need a button "apply offset to blind" after first fringe scan.

* Check impact of DDL transition Fixed->PRESET/SWAP (=SETAPOS with given RATE LIMITER to offset and transition to blind trajectory)
    - o check if rate limiter really works: need to record DDL metrology data
* test transition from blind/_-> blind/scan
* test transition from blind/_-> fringe search with an offset
* .....to be completed....

Other tasks:

- build new periscope for PRIMETA

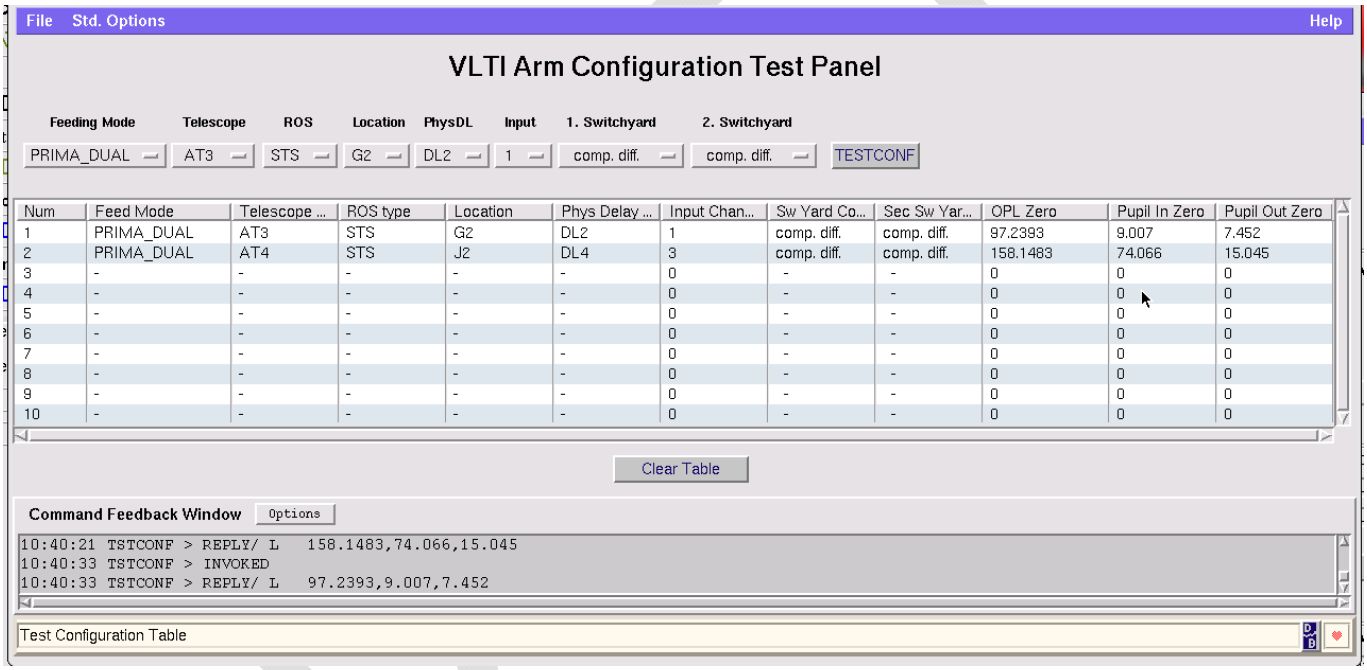
16 APPENDIX

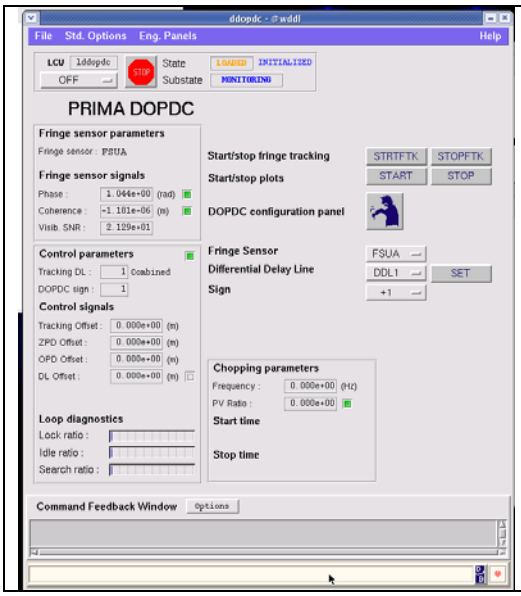
AT3-G2-DL2-IP1: OPL0=97m
AT4-J2-DL4-IP3:OPL0=158m
Orientation ~ almost East-West

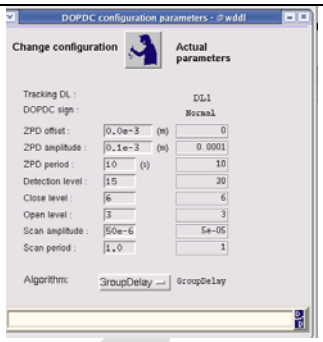
B(G2-J2)= 91.83~100m

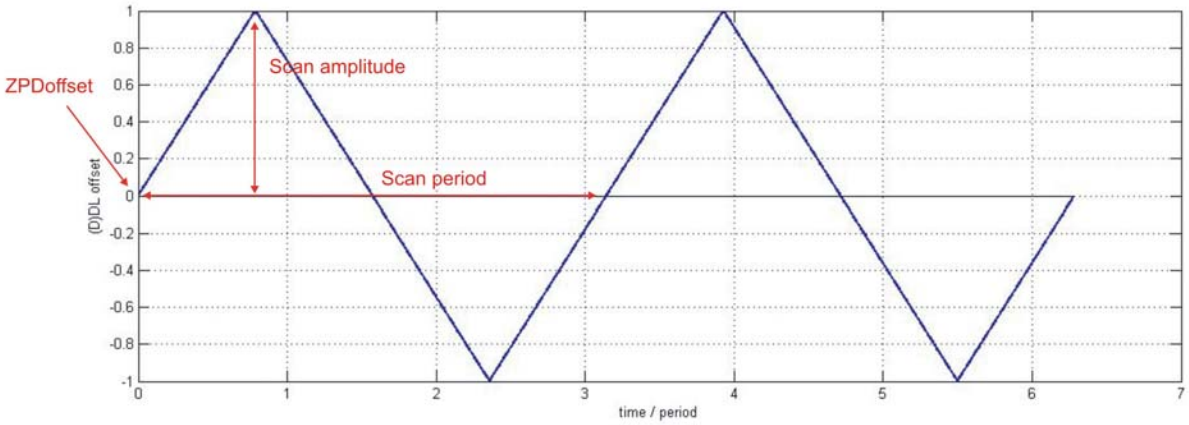
Observation at Zenith-> DL2 OPL must be increased

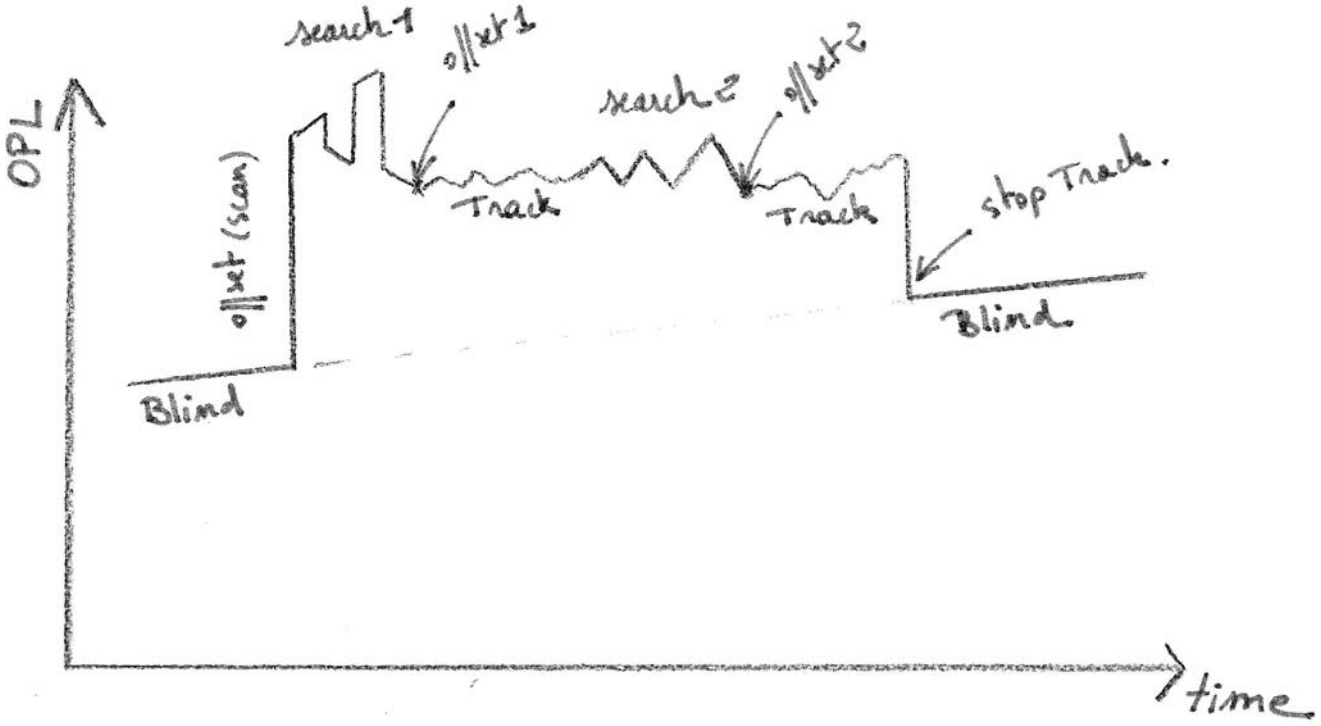
- Example for DL4~20m for enough tracking time, DL2 must be put at OPL=81m !




ddopdc - @ wddl
File Std. Options Eng. Panels Help
LCU 1ddopdc
OFF
STOP
State LOADED INITIALIZED
Substate MONITORING
PRIMA DOPDC
Fringe sensor parameters
Fringe sensor : FSUA
Fringe sensor signals
Phase : 1.044e+00 (rad)
Coherence : -1.181e-06 (m)
Visib. SNR : 2.129e+01
Control parameters
Tracking DL : 1 Combined
DOPDC sign : 1
Control signals
Tracking Offset : 0.000e+00 (m)
ZPD Offset : 0.000e+00 (m)
OPD Offset : 0.000e+00 (m)
DL Offset : 0.000e+00 (m)
Loop diagnostics
Lock ratio :
Idle ratio :
Search ratio :
Start/stop fringe tracking STRTFTK STOPFTK
Start/stop plots START STOP
DOPDC configuration panel
Fringe Sensor FSUA
Differential Delay Line DDL1 SET
Sign +1
Chopping parameters
Frequency : 0.000e+00 (Hz)
PV Ratio : 0.000e+00
Start time
Stop time
Command Feedback Window Options


DOPDC configuration parameters - @ wddl
Change configuration
Actual parameters
Tracking DL : DL1
DOPDC sign : Normal
ZPD offset : 0.0e-3 (m) 0
ZPD amplitude : 0.1e-3 (m) 0.0001
ZPD period : 10 (s) 10
Detection level : 15 30
Close level : 6 6
Open level : 3 3
Scan amplitude : 50e-6 5e-05
Scan period : 1.0 1
Algorithm: GroupDelay GroupDelay


ZPDoffset
Scan amplitude
Scan period
(D)DL offset
time / period
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6
7


search 1
search 2
Track
Track
stop Track.
Blind
Blind
OPL
time

__oOo__