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Prima Metrology Commissioning 4 (COM4) Technical Report 24-31 March 2009

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CHANGE RECORD

Issue	Date	Affected Paragraphs(s)	Reason/Initiation/Remarks
1		All	First issue

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1 INTRODUCTION

This document presents the results obtained during the PRIMET COM4 period held between 24/3 and 31/3/2009, with the support of **R.Frahm and S.Morel.** For the first time since AIV, two AT-STS were available for PRIMET operation . In addition, the DDL's were ready for the PRIMET tests.

At the beginning of COM4, AT#3 was not available. After fixing some hardware problems, AT3 was tested by Sciops on G2 on 24/3/09. Then AT3 was moved to H0 on 25/3/09 and tested again by Sciops. On 27/3, AT#3 was equipped with its STS and moved to G2. This explains why PRIMET was operated during COM4 mostly in cyclop mode, contrarily to what had been anticipated.

During COM4, only PRIMET B was operated with the telescopes (i.e Ip4 and IP2 shared with FSUB). PRIMET A was only operated on Marcel.

The time allocated for PRIMET COM4 was:

Date	Time allocation
Tue 24/3/09	1 night
Wed 25/3/09	1 night
Thu 26/3/09	1 night
Fri 27/3/09	1 night
Sat 29/3/09	½ night
Sun 30/3/09	1 night

Tasks defined for COM4 in VLT-TRE-ESO-15730- 4747 (COM3 technical report)

1. Replace one of the retro-reflector in Marcel to improve the PRIMET fringe contrast and allow FSU calibration without requiring access to the VLTI lab.
2. Assess the impact of the FSM actuation on the performance of the pupil tracking loop
3. Investigate the problem of beam alignment with the Switchyard and the DDL, as well as the associated DDL beam vignetting.
4. Measure the pupil motion introduced by the DDL during representative blind+fringe tracking (playback of a data file). Operate PRIMET in these conditions (i.e. including pupil tracking) and assess the robustness.
5. Implement and test PRIMET BTK
6. Additional tasks:
    i. Investigate why the gain of the quadcell changes by itself
    ii. Integrate new OD in front of quadcell
    iii. Check co-alignment on on FSUB
    iv. Implement BTK and new beam search capability (grid spacing and amplitude as parameter)
    v. Test Readback of STS

The laser safety rules defined during the AIV period and defined in memo ***TEL0820*** from 14/8/08 applied during the COM4 run.

2 CONFIGURATION

PRIMET used the following configuration:

AT#4-STS

Station J2-DL#4

AT#4-STS had the active VCM installed on Beam B and a fixed curvature VCM on Beam A

AT#3-STS

Station G2-DL#2

AT#2-STS had a fixed curvature VCM both on Beam A and Beam B

The baseline (G2-J2) is ~ 94 m.

The estimated internal OPD for DL#4 and DL#2 at OPL=15m is ~ 50 m

The OPL length (ip4, ip3) through DL#4(at OPL=15m) and AT#4-STS-J2 is ~ 150 m (1 way) or ~ 300 m (return way)

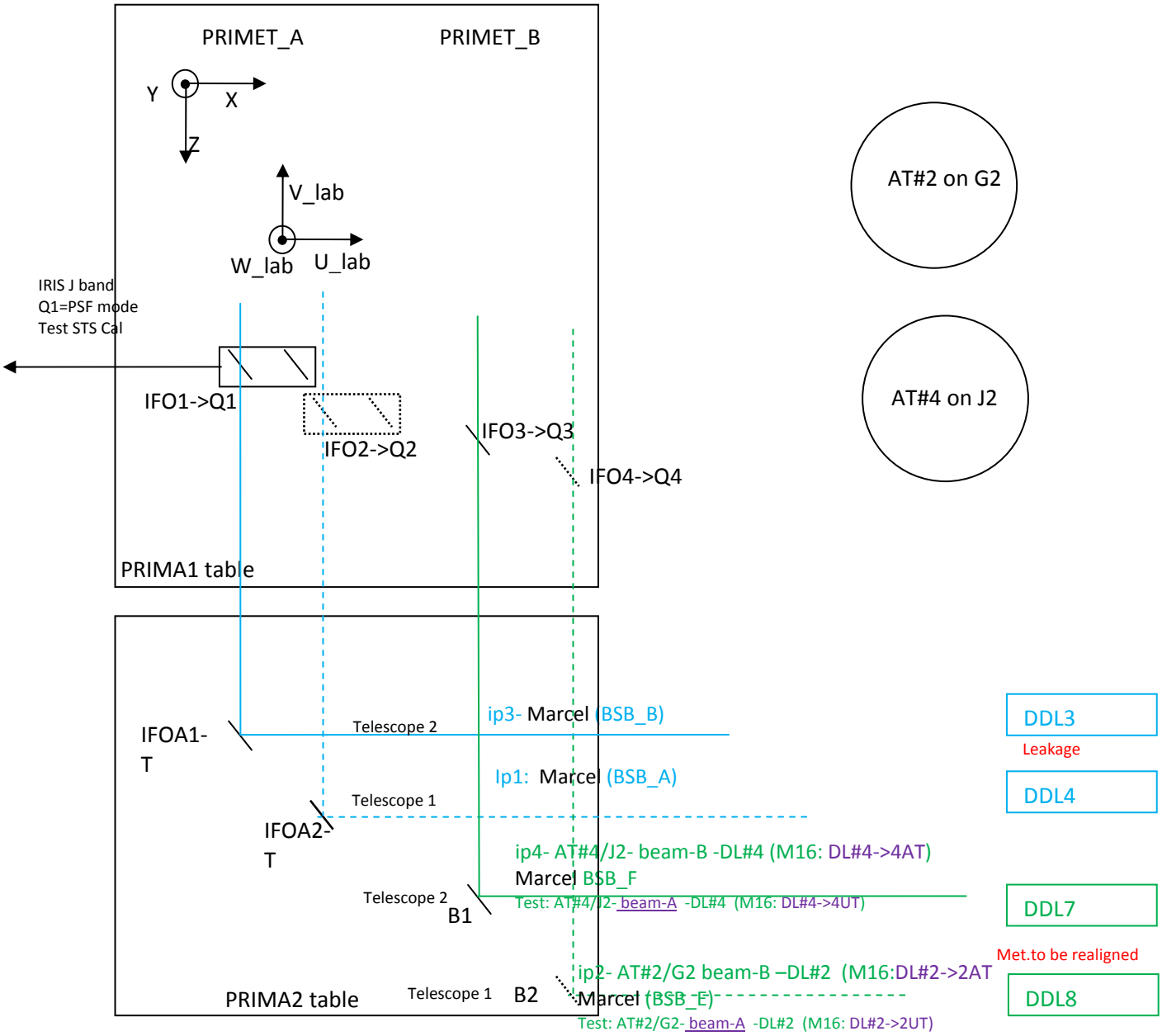


Figure 1: Beam routing for COM4 for PRIMET B ip2/4. PRIMET A was only operated on Marcel.

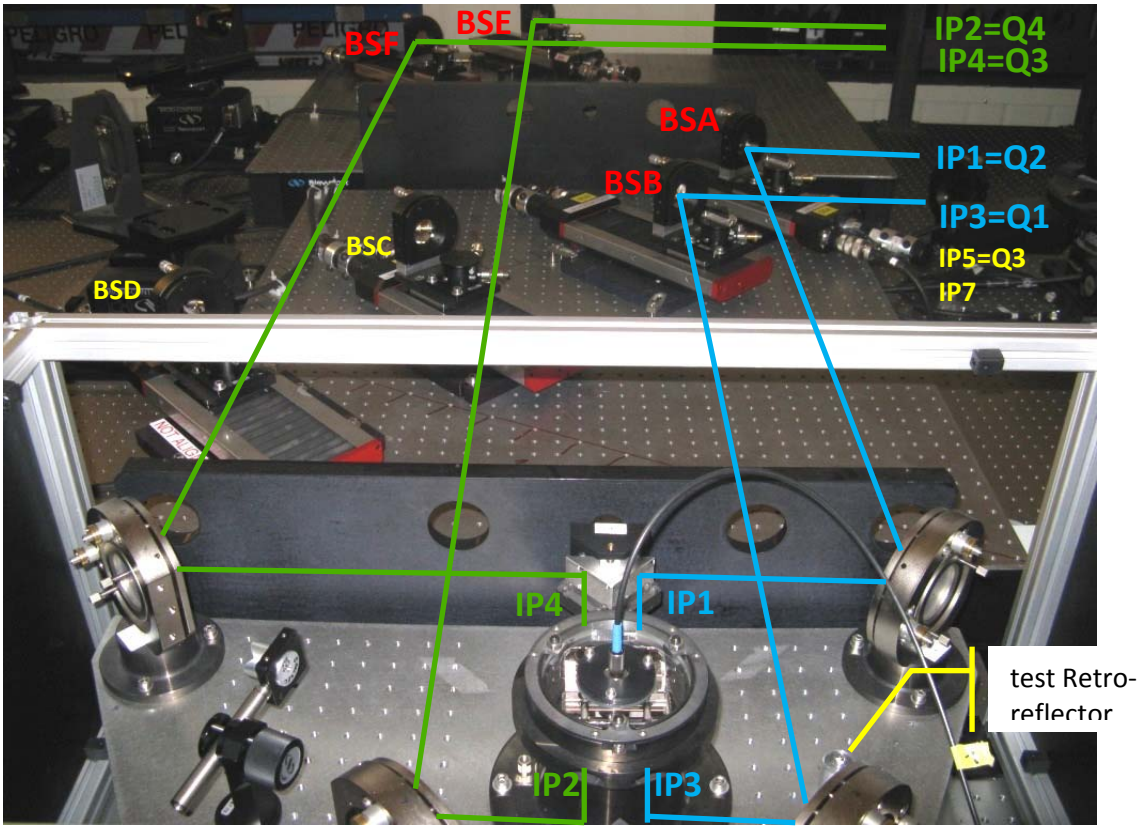


Figure 2: Marcel beam definition

3 TUESDAY 24/3/09

3.1 Installation and test of the Fringe Board

New electronic boards were installed inside lprmac(A-B):
two ESO custom “Fringe boards” which output the DC and RMS values of the metrology signal: The PROBE board and the REF board
a A201S+men M36 AI board which acquire the above values

The objective is to assess the quality of the metrology fringe signals using the PRIMET SW (i.e from the control room) , thus avoiding to rely on the oscilloscope located in the interferometric laboratory.

The connection between the two fringe boards and the M36 was done using a temporarily terminal block.
In addition an external power supply was mounted on the lprma2 rack to power-up the fringe boards.

test with a function generator: 450 or 650 kHz signals of defined PV and DC
(impedance TBC)

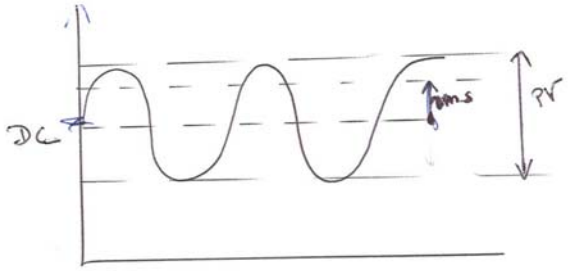
Conclusion:

- the channel 450 kHz DET1 of the REF board delivers a wrong rms value (factor 10 lower than in reality): origin TBC (HW or SW)
- For all other channels, the rms is ca.2 times lower than in reality: impedance problem ? gain problem? (TBC HW or SW)
- the back plane of lprmac is equipped with a “rail” which limits the space available for the back-plane connectors of the fringe boards
- The power supply of the fringe board cannot be inserted on the rear side of lprmac because the crate is not deep enough. The power supply can only be inserted in the crate of lprma2 which is deeper than lprmac

Tests performed by A.Jost on 20/6/09 have shown that
1) the detector card had a bad ground connection on one channel - as a result it worked sometimes and sometimes not: this problem has been corrected
2) The software reads the channels offset by 1: the first channel has been ignored - the last channel could therefore not be evaluated and the result of the visibiilty computation showed therefore a wrong result. The software has been debugged now and works fine.

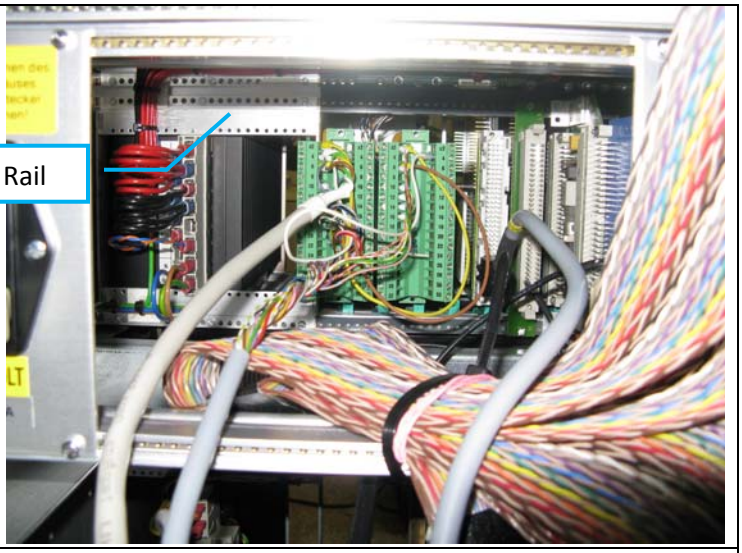
the documentation id available under:

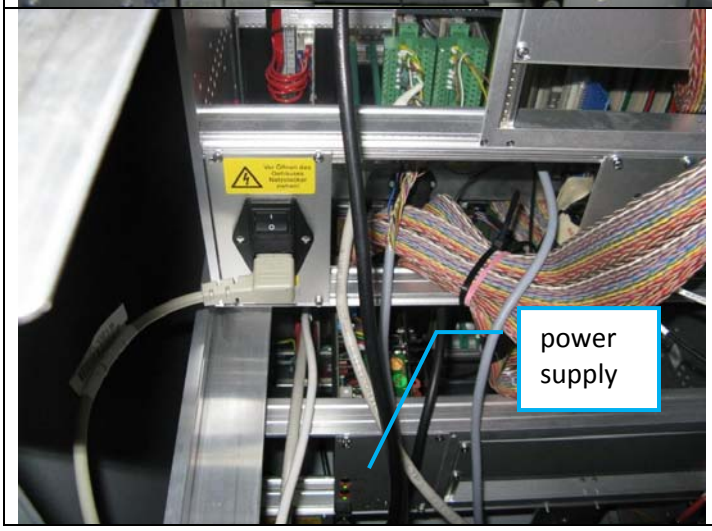
Values measured by the fringe board and sensed by pmacq: DC and RMS. The visibility is computed using V=sqrt(2)*RMS/DC



$$\gamma = \frac{V_{max} - V_{min}}{V_{max} + V_{min}} = \frac{PV}{2DC} = \frac{2\sqrt{2} \cdot rms}{2DC} = \sqrt{2}\,\frac{rms}{DC}$$

Cards Provides $\left(\frac{Rms}{DC}\right)$ Software does $\gamma = \sqrt{2}\, rms/DC$





3.2 Calibration of the FSUB ACU TTP and check difference between BTK on SUM or on a single fiber

we run BTK on FSU B + Marcel
The results are:
TTP 1 Ip2 X= -245.9e-6 rad Y= 119.2e-6 rad
TTP2 Ip4 X=-187.4e-6 Y rad =-766.9e-6 rad

Flux FSUb (sum)= 55800
A=24200
B=26400
C=3000
D=1100

Significant difference of flux between AB and CD indicates that these groups of fibers are not well co-aligned. Nevertheless, this misalignment is probably small.
Indeed, by running BTK (with both beams) on fiber B only and then on Fiber C only, we noticed that the difference in TTP position was less than 65 micro_rad (mechanical), i.e < 1 fiber FWHM

The 2 famillies AB and CD corresponds to a tilt of the beam combiner

A & B are co-aligned
AB and CD are not co-aligned (amplitude unknown)
B and C are not co-aligned, but the estimated amplitude is of the order of 1 fiber FWHM (65 mrad mechanical)

BTK on the sum probably defined by the position which feeds best A&B ?

Check impact of doing BTK on SUM or on a single fiber
Beam 1 (IP2)
BTK on SUM TTP 1 (IP2) X=-2.5e-4 Y=1.18e-4 rad meca
BTK on fiber B only TTP 1 (IP2) X=-2.56e-4 Y=1.058e-4 rad meca

- Difference~ 20 microrad along Y (4 arcsec meca)

Beam 2 (IP4)
BTK on SUM TTP 2 (IP2) X=-1.8e-4 Y=-7.548e-4 rad meca
BTK on fiber B only TTP 2 (IP2) X=-1.904 Y=-7.681e-4 rad meca

- Difference~ 10 microrad along Y (2 arcsec meca)

➔ ***Conclusion: no significant difference if one does BTK on SUM or on a single fiber***

3.3 Assessment of the PRIMET B fringes on Marcel without/with new retro-reflector

ACU are set to the TTP values found after BTK of section 3.2

- PRIMET B REF signal is OK
- PRIMET B PROBE:

- very weak fringe signal
- little flux coming back from Ip2.
- Same situation if we use the new corner cube inserted on Marcel. (i.e weak fringe signal is not a problem of WFE of the Corner cube). This was actually tested on Wed 25/3 and not on Tue 24/3, after gluing ϕ=7mm diameter retro-reflector in its ESO-made housing.
- the PRIMET laser beam (IP2) appears 10 mm off, in diagonal, with respect to the center of the reference plates of the MIDI feeding optics table. The plates are located 8 m from the PRIMET injection optics. This corresponds to an angle of α=1.e-2/8=1.25 mrad
- The ghost is not blocked anymore by the folding mirror of the extraction block of PRIMETB !! (impact on the quadcell and phase meter operation to be checked)

We offset the Tilt of TTP1-IP2 to retrieve better fringe signal on PRIMET B:
As calibrated in section 3.2): TTP 1 Ip2 X= -245.9e-6 rad Y= 119.2e-6 rad
After offseting TTP1(IP2) TTP 1 Ip2 X= -100e-6 rad Y= -400e-6 rad
ΔX=145e-6rad and ΔY=-520e-6rad, leading to ΔRadial=540 -6rad meca =1.08 mrad (optical)
This is consistent with the physical shift of PRIMET Ip2 described above (1.25 mrad)

However, the fact that a good enough fringe signal can be found with PRIMETB on Marcel is not in line with what was experienced in the last months (see email from N.Schuhler dated 11/1/09):

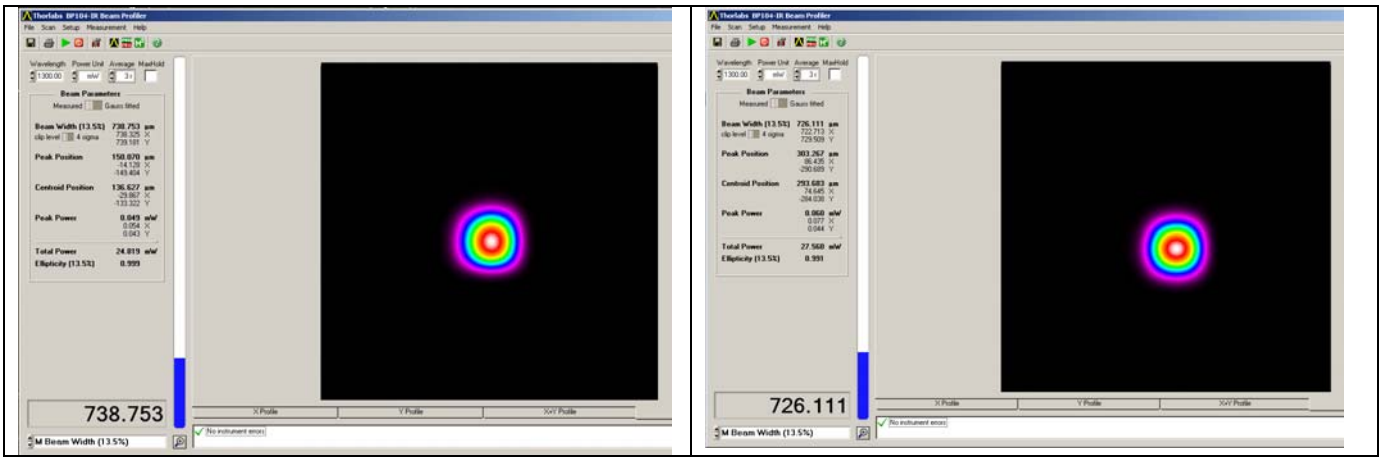
- P and S extracted flux are well balanced at the ouput of the probe fiber
- very low fringe contrast (10-15%) unless an "external" corner cube is inserted in front of Marcel IP4. A sufficiently high fringe contrast could be obtained after adjusting laterally the corner cube in front of Marcel IP4. The corner cube was visually more or less centered on the marcel's aperture.
- no indication about a misalignment of PRIMET IP2 while propagating towards Marcel

Evolution of the Visibility of PRIMET B PROBE
- AIV 8/08: V ~30-40 %
- COM1 10/08 : V ~30-40 %
- COM2 11/08 : no data but good enough to make observation
- Dec'08: V ~10-15 %
- COM3 022/09: no data

3.4 Estimation of the tilt between the PRIMETB Beams at the output of the injection block

<u>At 18 cm away from the PRIMET injectionblock</u>
(using a folding mirror at the output of the injection block
ΔX(S-P)=104 ΔY(S-P)=-151

ONLY P: Centroid x=-30 Y=-133 Power:24.8 mW ϕ~740 μm; ε=0.99	ONLY S: Centroid x=74 Y=-284 Power 27.56 mW ϕ~726 μm; ε=0.99



The power injected in free space in well balanced: 24.8/27.56~ 0.9 !

<u>At 16.5 cm:</u>
Be careful: the axes of the beam profiler are not aligned along lab horizontal and vertical axis !!)
ONLY P: Centroid X=-160 Y=88; ONLY S: Centroid X=-40 Y=-41

- **At 16.5 cm ΔX(P-S)=-120 ΔY(P-S)=130 ΔRadial=177 microns**
  (during AIV: ΔX(P-S)=10 ΔY(P-S)=200, with the beam profiler axis aligned along horizontal and vertical directions). So the current situation is comparable to the AIV

Shift of 28 cm of the beam profiler:
<u>at 16.5+28cm=44.5 cm</u>
ONLY P: Centroid x=116 Y=300; ONLY S: Centroid x=224 Y=101

- **At 44.5 cm ΔX(P-S)=-108 ΔY(P-S)=199 ΔRadial=226 microns**

<u>Estimated tilt error between the injected metrology beams (last alignment done on 10/1/09 by NSC)</u>
δΔRadial=49 microns for a longitudinal shift of 28 cm:

θ_{P-S}=49e-6/28e-2=175 μrad
~36 arcsec_lab
~ 2.6 pixel on Iris

- The angular error between the PRIMETB beams P (IP4) and S (IP2) at the output of the injection block (θ_{P-S}=0.175 mrad or equivalent to 2.6 pixels on IRIS) is 7 times lower than α and cannot explain the misalignment of PRIMETB IP2
- For comparison : FOV of extracting fiber is ~ 5 microns/5mm=1mrad (i.e. much larger), so if we inject ip4 and if ip4 and ip2 are superimposed at 36 arcsec level, we should also inject ip2 without problem!

3.5 Verification of the Marcel positions on IRIS

tues 24/3 logged on Autrep (based on autrep plots)

Q1beam B IP3~64.5 65.7
Q2 beam A IP1~ 67.7 67.1 shifted by ~3 pix on IRIS, reason unkown
Q3 beam F IP4~63.1 63.5
Q4 beam E IP2~ 64.3 63.3

4 WEDNESDAY 25/3

4.1 History of the TTP positions obtained by BTK on Marcel

Based on the FSU logs :

Value 30/1/09
TTP 1 (IP2) X=-89e-6 Y=-75e-6 rad meca
TTP 2 (IP4) X=340e-6 Y=-139e-6 rad meca

Value 24/2/09 after BTK on SUM
TTP 1 (IP2) X=-250e-6 Y=118e-6 rad meca
TTP 2 (IP2) X=-180e-6 Y=-754.8e-6 rad meca

Value 28/2/09
TTP 1 (IP2) X=-248.6e-6 Y=109.7e-6 rad meca
TTP 2 (IP4) X=-183.9e-6 Y=-804.7e-6 rad meca

Value 1/3/09
TTP 1 (IP2) X=-242.8e-6 Y=111.7e-6 rad meca
TTP 2 (IP4) X=-182e-6 Y=-798e-6 rad meca

Value 24/3/09 (see section 3.2)
TTP 1 Ip2 X= -245.9e-6 rad Y= 119.2e-6 rad
TTP2 Ip4 X=-187.4e-6 Y rad =-766.9e-6 rad

There is a significant difference between 30/1 and all values recorded after 24/2.
Values recorded from 24/2 until now have a similar amplitude

Difference between 30/1 and 24/3
TTP1 (IP2) ΔX= -89+245.9= 157 ΔY=-75-119=194
ΔRadial=250 microrad meca (~50 arcsec_lab or 3.6 pixels on IRIS)
TTP2(IP4) ΔX=340+187=527 ΔY=-139+766 = 627
ΔRadial=819 microrad meca (169 arcsec_lab or 12 pixels on IRIS)

A shift of TTP1 (IP2) ΔRadial=250 μrad meca =0.5mrad (optical) only introduces a beam shift of 3.5 mm on the reference plate of the midi feeding optics table (located ~ 7m from the TTP). This cannot explain the 10mm shift of PRIMET IP2 decribed in section 3.2

Assuming that marcel and all "fixed" mirrors between marcel and the FSU did not move,
we can compute the motion of the FSU fibers that would correspond to such variation of the TTP position.
Considering a focal length of the FSU doublet of f=62.0543 mm (at λ=2.3 μm), we have:
for TTP1:
δd= 250 e-6 .2. 62.0543 e-3= 31 μm (factor 2 used for the tilt of the optical beam w.r.t TTP mechanical motion)
~3.8 psf diameter

for TTP2

δd= 819 e-6 .2. 62.0543 e-3= 101 μm

~12.6 psf diameter

(the psf diameter is computed using λ/d*f=2.3.e-6/18e-3. 62.0543 e-3~ 8 μm)

4.2 Verification of the position of Marcel on IRIS

wed 25/3 logged on AUTREP at 9h00:
Q1beam B IP3=64.04 65.53
Q2 beam A IP1=67.93 67.16 shifted by ~3 pix on IRIS, reason unkown
Q3 beam F IP4=63.27 63.21
Q4 beam E IP2=64.49 63.78

-> same position as yesterday

4.3 Verification of the Footprint of Marcel at the output of the FSUB using red laser

The beam generated by Marcel seems more or less centered on the ACU M1 which tends to indicate that IFOB mirrors are well aligned. Considering that the distance d(IFOB/FSU-ACUM1) is about 3.5 m. and that the beam centering is visually estimated within ~+/- 3-5mm, this leads to an angular precision of more than +/-1 mrad (=206 arcsec=14 pixels on IRIS)
If the IFOBs had been tilted, we should see the effect on the IRIS centroids (which is not the case according to section 4.2), unless the error was corrected in the past by moving the IRIS IFO3 or IFO4. This scenario is not plausible.

Footprint of Marcel at the output of the FSU (pupil):

- Ip2 and Ip4 are not superimposed: mainly vertical shift of about 4 mm
- The Marcel beam is slightly shifted with respect to the shadow of the FSU-BC central patch especially for IP2
    - Ip4: marcel beam too high by 1.5-2mm along +W and slightly along -U
    - Ip2: marcel beam too low by 3.5 mm along -W
- Noticeable Flux difference between ip2 and ip4 (but it also depends on the flux distribution of the red beam shining on Marcel's parabola)

4.4 Summary and Conclusion on alignment issues

1. After BTK on Marcel, the PRIMET laser beam (IP2) is misaligned (diagonally) by 10 mm with respect to the center of the reference plates of the MIDI feeding optics table, or α=1.25 mrad. This led to a low retro-reflected flux from Marcel Ip2 and a weak PROBE B signal.
2. The angular error between the PRIMETB beams P (IP4) and S (IP2) was checked at the output of the injection block: θ_{P-S}=0.175 mrad is 7 times lower than α (14 %).
3. Marcel IP2 and IP4 are well centered on IRIS (within 0.5 pixel of 64;64=7 arcsec_lab=34µrad) whereas IP1 is shifted by more than 3 pixels (42 arcsec_lab=0.204mrad) and IP3 is shifted vertically by 1.5 pixels (21 arcsec_lab=0.102mrad). The last verification of the alignment of Marcel using the sighting scopes was performed by SME and PHA during COM3 (1st week of February 2009) on IP2 and IP4. At that time both Marcel IP2 and IP4 were aligned with respect to the center of the reference plates of the MIDI feeding optics table.
4. There is a significant difference of the TTP1 and TTP2 values between 30/1 and all values recorded after 24/2. Values recorded from 24/2 until the beginning of COM4 (24/3) have a similar amplitude.
    a. For TTP1(IP2) ΔRadial=0.25 mrad meca, leading to a beam shift of 3.5 mm on the reference plate of the midi feeding optics table. This represents 35% of α
    b. For TTP2(IP4) ΔRadial=0.82 mrad meca (169 arcsec_lab or 12 pixels on IRIS) (The reason of this large variation is unkown)
    c. Because the values of ΔRadial are significantly different for TTP1 and TTP2 (see above), the origin of ΔRadial cannot be explained by a motion of the FSU fibers or a motion of the FSU beam combiner
5. The beam generated by Marcel (IP2 and IP4) seems centered (+/- 3-5 mm) on the ACU M1 and on IRIS (0.5 pixel as mentioned see above). This tends to indicate that the IFOB's are well aligned (unless the error was corrected in the past by moving the IRIS IFO3 or IFO4.
6. The Footprints of Marcel at the output of the FSUB (pupil) are not superimposed (mainly a vertical shift of IP2):
    a. Marcel IP2 is lower than the shadow of the FSU-BC central patch by 3.5 mm along -W
    b. Marcel IP4 is higher than the shadow of the FSU-BC central patch , by 1.5-2mm along +W and slightly along -U
7. BTK indicates that AB and CD fibers are not well co-aligned (significant flux imbalance). The FSUB Beam Combiner moved since January 09. Nevertheless, this misalignment is probably small. As indicated in section 5, the shift between B and C is estimated to be slightly less than the FSU fiber FWHM (8µm or 65µrad_lab).
8. The ghost is not blocked anymore by the folding mirror

<u>Some activities performed during COM3 (28/1-6/2/09) by SME:</u>
Alignment of the pivot point of the ACU of FSUB (2 iterations, 1 day).
Before the alignment, the beam reflected by IFOB was shifted vertically by ~ 1mm on the FSU
IFOB tilted to center beam on ACU- FM1
Then, ACU-FM1 and ACU are moved to center the beam on the shadow of the central patch of the FSU-BC.

Beginning of February : verification of the position of marcel on the sighting scope
Marcel is aligned on IRIS 64;64

IFOA mirroirs (new roof mirrors on IP1 and IP3), aligned end Jan 2009 (philippe/Sebastien).

Consequences of a BC tilt (courtesy SME)

- The injection cannot be optimised for A,B,C,D simultaneously any more, but only for A & B or C & D
- When running BTK on one fibre (case 1), injection is optimised for this fiber for BOTH BEAMS, but is not optimised for the other fibers (BOTH BEAMS are still superimposed for all fibers, but their injection is optimised for the BTK reference fiber only).
- When running BTK on the SUM (case 2), BOTH BEAMS are superimposed, but injection is optimised for none of the fibers, only for their sum.
- The difference of TTP positions between cases 1 and 2 is smaller than the max distance between fibers (i.e. less than 1 PSF FWHM in our case

4.5 PRIMETB operation in cyclop mode on AT#4-B-J2-DL4-IP4

4.5.1 Adjustment of the pressure of the DL#4's VCM

Theoretical Pressures are first used, then we go in the lab and adjust manually the VCM of DL#4

Configuration AT#4 on Ip4	
AT#4-STS	J2-Beam B
FSMB	15 15 (edge position 12.6;12.9) according to COM3 report)
VCMB	27.3 5.984 default value 4.74e-3mm-1 (1.9524 bar)
DL#4	OPL=14m VCM 3.77e-3 mm-1 =1.65 bar Instead of ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1) =3.999341e-003 mm-1 to get enough flux on the beam profiler (but not yet to optimize the beam size/shape)
M16	DL#4-4AT (to feed Beam B in ip4)
Switchyard	SW4->BC
DDL	no
Ip	**Ip4** (Ip2 is mis-aligned and cannot be used)
Primet Pol	P Quadcell 4

Beam profiler located in front of ip2 quadcell, using a (30/70)BS
The returned metrology beams is observerd on the beam profiler shown in

Figure **3**

ϕ=1689 µm (13.5 %)
P=0.04 mW, i.e P=0.04/0.7/0.3=0.19 mW in front of BS1 (see

Figure 3)
ε=0.715

Assuming that the power of the PRIMET P polarization emitted in free space by the injection optics is still Pi=24.8 mW as measured 1 day earlier (see section 3.4), the total transmission (FSU+VLTI+STS) measured in front of BS1 is
T=0.19/24.8=0.76 % 0r ~ 1/130
(DOES NOT SOUND MUCH)

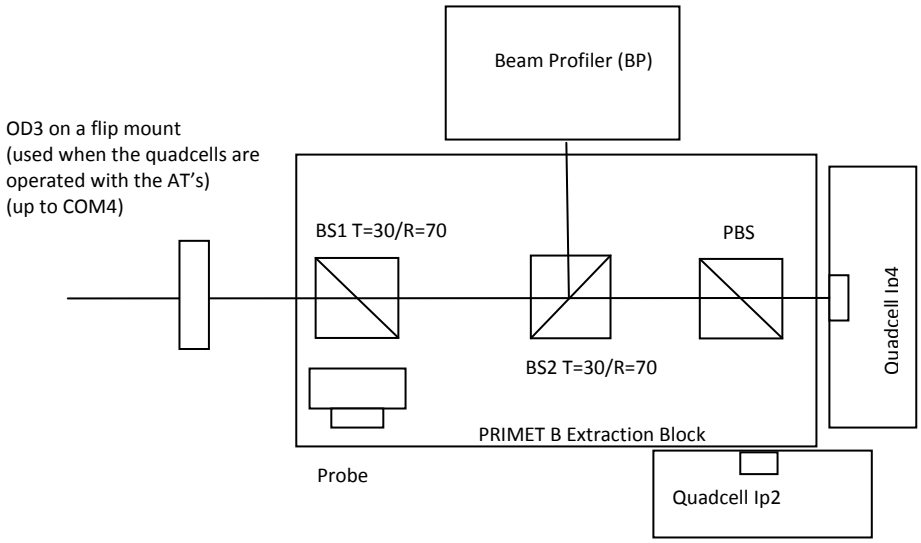
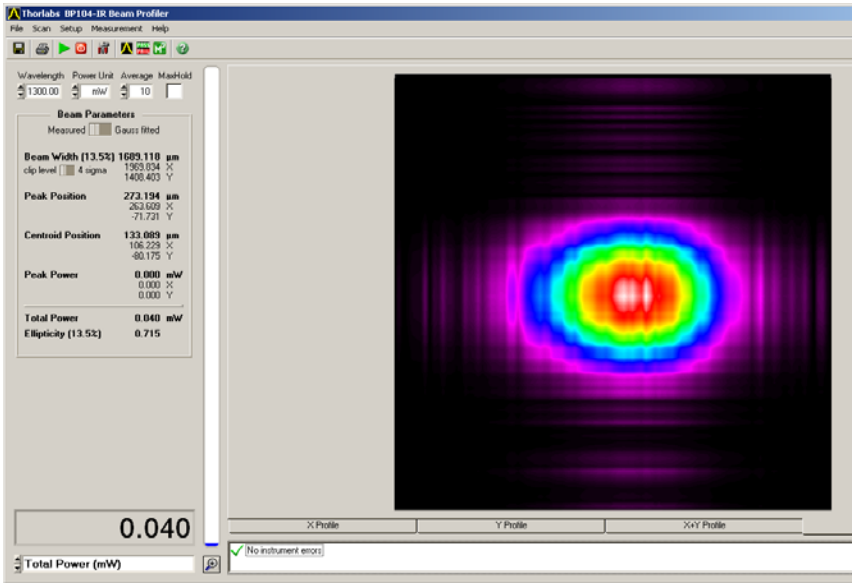


Figure 3: sketch of the extraction optics of PRIMETB



The beam quality appears worst than what was reported in previous COM reports, but the beam is observed after the FSU-BC and after BS1 and BS2. See section 5.3 to infer the degradation of the beam quality and transmission loss of BS1 and BS2

4.5.2 PRIMETB Beam Tracking tests on Ip4

we attempt PRIMET Beam tracking in the conditions described above.
Circular modulation observed on the beam profiler and on the quadcell data.

File name	Parameters
Centroids2009-03-26T04.22	beam centered BTK amplitude 0.01
Centroids2009-03-26T04.25	beam offseted by 0.2 BTK amplitude 0.2
Centroids2009-03-26T04.26	beam centered BTK amplitude 0.2
Centroids2009-03-26T04.31	beam offseted along Y by XX BTK amplitude 0.2

For the above files, DemodX and DemodY were recorded in the correction files (i.e. sampling at Fcorr=100Hz).
DemodX and DemodY shall be written in the centroids file (i.e. at the sampling freq. of ~ 1kHz).
Robert does the modifications for Thur 26/3 (see section 5.5)

warning: all quadcell file have a wrong header
2nd line : "sampling frequency in Hz:" was changed by mistake to "sampling rate".
reason unkown. To be modified for next COM

4.5.3 PRIMETB operation with Pupil tracking and DL motion (enclosure closed)

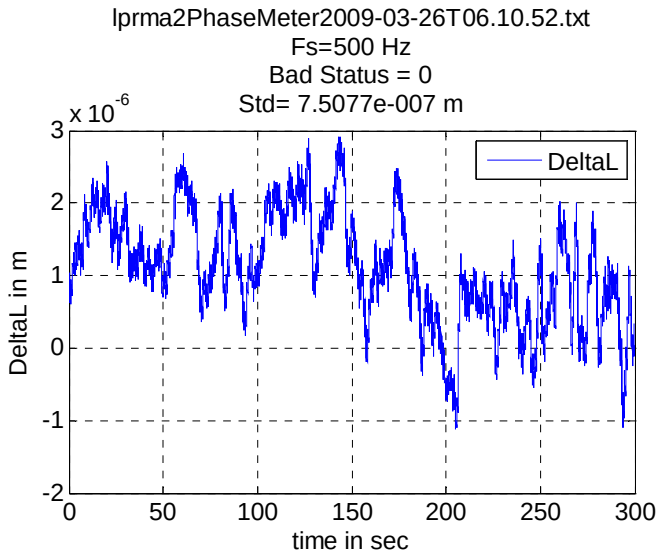
Because AT#3 is not available, we need to use PRIMETB in cyclop mode: IP4 propagates up to AT#4-STS-Beam B, whereas IP2 is retro-reflected "locally". Because IP2 is badly aligned on Marcel (see section 4.4), we need to use a dedicated retro-reflector:
Initially we try with a retro-reflector located at the center of the tunnel, but after setting the pressure of the DL#3 VCM, the returned flux is too low.
Finally, we use the retro-reflector of the FSU warmoptics (pfacuguib/pfttpguib) and add a OD=3 in front of the extraction bloc (see

Figure 3).

(Did we really work with the OD 3 in front of the extraction bloc ?
if yes, the flux coming from back from AT#4 (IP4) and from the retroreflector of the FSU must be comparable ??)

We close the pupil tracking loop on IP4 and simultaneously record phase meter data (AT4 enclosure closed)
We use the same parameters as in COM3 for the same configuration (IP4 AT#4) (see COM3 report p.36)
Gain= -0.015 A1=-1.8904 A2=0.8921 B1=-1.999 B2=0.999
except that IM becomes 100-1 instead of the identity because we don't go through the DDL as during Com3 (see section 10)

FileName	Comments	Fs(Hz)	Tobs(s)	Beam radisu. um	Radial Peak(rad) w.r.t 1st point	Radial rms (rad)	Radial Pk um	Radial rms um
Pupil tracking loop closed on IP4;No DL/DDL Motion ; Enclosure Closed;								
Centroids2009-03-26T05.26	PGA= 1 TRANS=1 beam is elliptical because Q~1Q3 and Q2~Q4	1000	300	-	0.11	0.018	-	-
Centroids2009-03-26T05.41	PGA= 1 TRANS=1	500	300					
Centroids2009-03-26T05.48	PGA= 1 TRANS=1	500	300					
Centroids2009-03-26T06.02 lprmac-26T06.02.39 (A-B recorded only)	PGA= 1 TRANS=1	500	300					
Centroids2009-03-26T06.10 lprma2-26T06.10	PGA= 1 TRANS=1 DeltaL PV= 4.03e-006 m DeltaL rms= 7.50e-007 m Status Not OK: 0	500	300		0.18	0.019		



STS VCM-B is slightly adjusted:
After init standby online :19,19
Absolute Offset U=8.3 W=-13.8
To reach Target pos= 27.3 5.2

Pupil tracking loop closed on ip4
DeltaL measurements started
DL#4 tracking from OPL=14m at 5mm/s (meca)
VCM not compensating for OPL variations
we use under wdline –dl dltestTrack ldlnumber startOPL speed in mm/s

➔ **dltestTrack ldl4 14 5**

OPL=14m to 15.75m

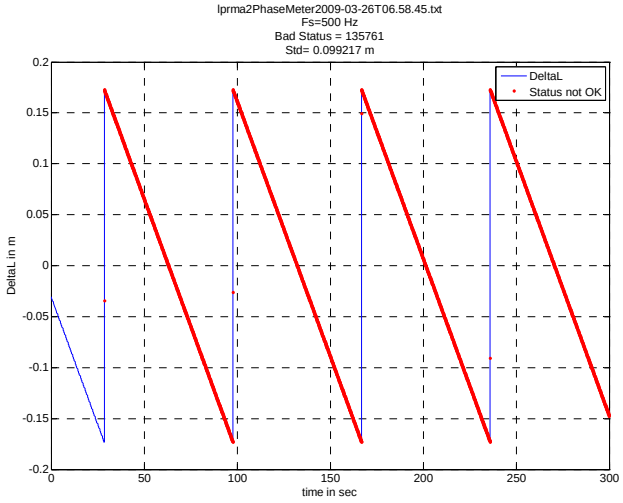
Centroids2009-03-26T06.58 :

Pk= 1.37e-1 p rms= 1.7e-2 p

Lprma2PhaseMeter2009-03-26T06.58 :

DeltaL PV= 345 cm (overflow)

No glitch (only overflow status)



Centroids2009-03-26T07.06 (started later than lprma2 files but both are stopped simultaneously

Pk= 15% rms= 1.8e%

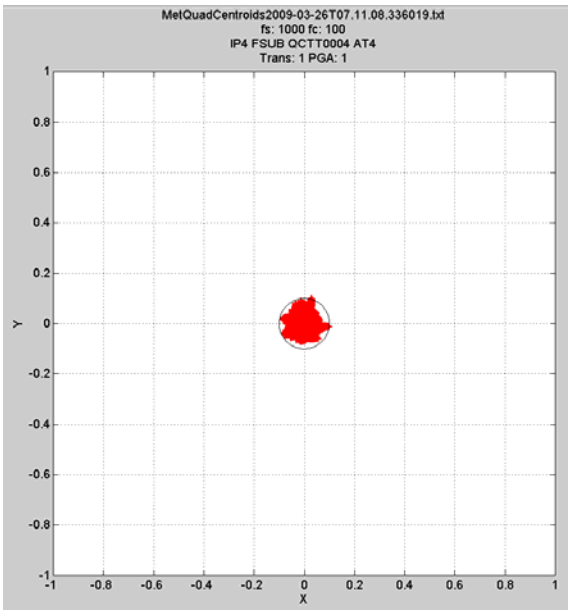
Lprma2PhaseMeter2009-03-26T07.04

Centroids2009-03-26T07.11(started later than lprma2 files but both are stopped simultaneously

File ends with the DL at 19.5 m

Pk= 10 % rms= 1.5%

Lprma2PhaseMeter2009-03-26T07.11



Pupil tracking performance are excellent in the current operating conditions
Pupil tracking does not introduce glitches but the dome is closed and IP2 is a fat beam !!!)
This excludes here overlap problem !

5 THURSDAY 26/3

5.1 Identification of Marcel IP2 / IP3 mis-alignment and consequences

In addition to the alignment issues described in section 4.4, we observed that the centroids of the marcel beams IP3 and IP2 have significantly moved on IRIS. The Marcel roof mirror common to these 2 IPs has probably been tilted Thursday 26/3 afternoon for an unknown reason (see section 11).

In particular, Marcel is not-co-align on the VLTI axis on IP2 (used by PRIMETB). Running the FSU BTK in this configuration will affect the alignment and performance of PRIMETB on the AT-STS (wrong ACU position). We decide not to correct this error by tilting IFOB(IP2), because the same intervention would have been needed on IP3 (used by science) and we were not yet sure about the origin of the problem.

In this configuration, we run BTK on the SUM on FSUB

TTP 1 (IP2) X=-286e-6 Y=254e-6
TTP 2 (IP4) X=-188e-6 Y=-777.6e-6 rad meca
SUM:40000 A~17400 B~15000-> improved C~ 4200 D~ 2900

Compared to BTK performed the 1st day of COM4 (24/3)
TTP 1 (Ip2) X= -245.9e-6 Y= 119.2e-6
TTP2 (Ip4) X=-187.4e-6 Y=-766.9e-6
thus
ΔX(IP2)= -286+245.9= -40 ΔY(IP2)=254-119=135
ΔRadial(IP2)=141 microrad meca (~58 arcsec_lab opticalor 4.14 pixels on IRIS)
this corresponds to the shift observed on IRIS for IP2 between 24/3 and 26/3 (see section 11)

The new position of TTP1(IP2) (which compensates for the motion of Marcel IP2), actually partially improved the mis-alignment of PRIMET IP2 with respect to the center of the reference plates of the MIDI feeding optics table, reported in section 4.4 !!!!

Two sighting scopes have been installed on Ip2 and Ip4. By connecting the red laser diodes to PRIMET fibers, we checked the PRIMET alignment on the sighting scopes. It looked OK which suggests that this verification method may not be precise enough…

We attempt to operate PRIMET in these conditions.

5.2 PRIMET B alignment using AT#4-TCCD (wrong method)

AT#4 TCCD started
BeamB: FSM and VCM aligned
Beam A: unknown position
M16:DL#4-4AT

FSM/VCM position not recorded
DL-VCM pressure unknown

➔ does it affect similar way DL metrology and PRIMET straylight spots: 1st order , yes I think…

However, no garanty that in this particular configuration, the DL metrology straylight corresponds to VLTI axis !!

DL#4 straylight: 2 spots on 186;180 (top spot) and 188;30 on TCCD
Blocking feed beamB: both spots disappear
Blocking feed beamA: nothing happens
Interpretation: the 2 spots are generated by M9 (back reflection)
Moving the FSMB: both spots are moving by the same amount

Coarse Estimation
IP4 PRIMET (with M16 4AT): 196 188 (top spot) and 197;28 (weaker: coming from 2nd reflection on M9)

After stopping the DL metrology beam and adjusting the DIT:

- Ip4 on AT-TCCD through beam B (with M16 4AT):185.5 191.5 (top spot)
- Ip2 on AT-TCCD through beam B (with M16 2AT) 184.5 198.5 (top spot)

The difference between PRIMET Ip4 and IP2 top spots is about 7 pixels (vertically).
With a TCCD scale of 6pixels/arcsec_sky, this corresponds to an angle of ζ= **116 arcsec_lab (8.3 pix on IRIS)**.
ζ can be split into the following contributions:

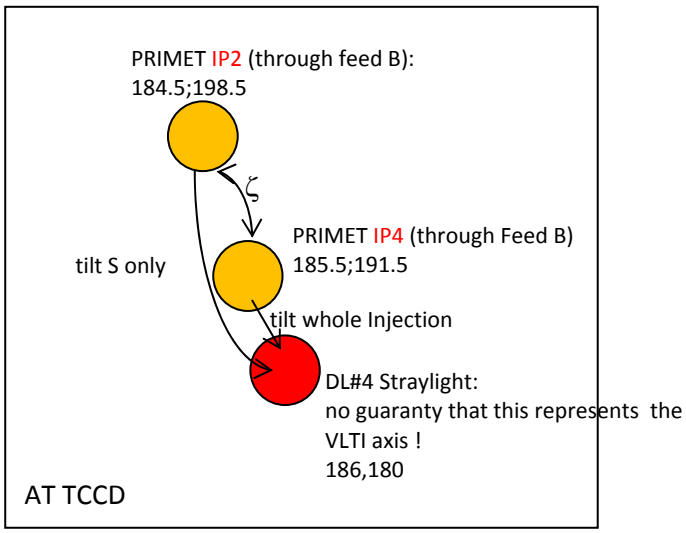
- tilt introduced between the positions 2AT to 4AT: the contribution to M16 is assumed to be negligible (even with factor 4.4 to be applied to convert into an angular error in the lab when using the Beam Compressors). TBC
- tilt between PRIMET S&P beams at the output of the injection block.(see section 3.4) **$\theta_{P\text{-}S}$=175 µrad~36 arcsec_lab ~ 2.6 pixels on Iris**
- tilt error of the FSUB ACU's because Marcel is not co-aligned on the VLTI axes. This is dominated by TTP1-IP2 (see section 5.1). **ΔRadial(IP2)**=141 µrad meca **~58 arcsec_lab opticalor ~4 pixels on Iris.**
- tilt error of the wedges of the polarization patches of the FSU/BC. Each wedge was specified to be β=24 arcmin, with a tolerance of $\delta\beta$=+/- 1 arcmin_lab (not verified by Alenia/RMI). [In principle, partially compensated by **$\theta_{P\text{-}S}$** as long as the Ref. signal is good enough]
- co-alignment error between PRIMET and the FSU fibers (TBC)

We try the following alignment method:
1/ with M16:DL#4-4AT (i.e to feed IP4 to STS-B) , the whole PRIMET injection block is tilted to superimpose PRIMET IP4 on the DL straylight.

- TTP2 (IP4) has been adjusted to feed Marcel (IP4) in the FSU. Marcel IP4 is aligned on IRIS (IP4=63.20 63.19), and therefore on the VLTI. Assuming that the DL straylight on the AT-TCCD represents the VLTI axis (TBC), we should have co-aligned on IP4 PRIMET, FSU, MARCEL and VLTI

2/ with M16:DL#4-2AT (i.e to feed IP2 to STS-B), The PRIMET S injection beam (IP2) is tilted to superimpose IP2 on the DL straylight

- as realised a-posteriori, this is not the correct method. Indeed, TTP1(IP2) has been adjusted to feed Marcel (IP2) in the FSU. But Marcel (IP2) is not aligned on IRIS ! (IP2=65.5 59.8), i.e. not on the VLTI. The result is that
  - Marcel(IP2) and the FSU are co-aligned along a so-called "direction 1"
  - PRIMET S (IP2) and the DL straylight are co-aligned along "direction 2" (~ VLTI axis, TBC)
  - direction 1 is tilted with respect to direction 2 (~VLTI axis) by ~4 IRIS pixels (56 arcsec lab)



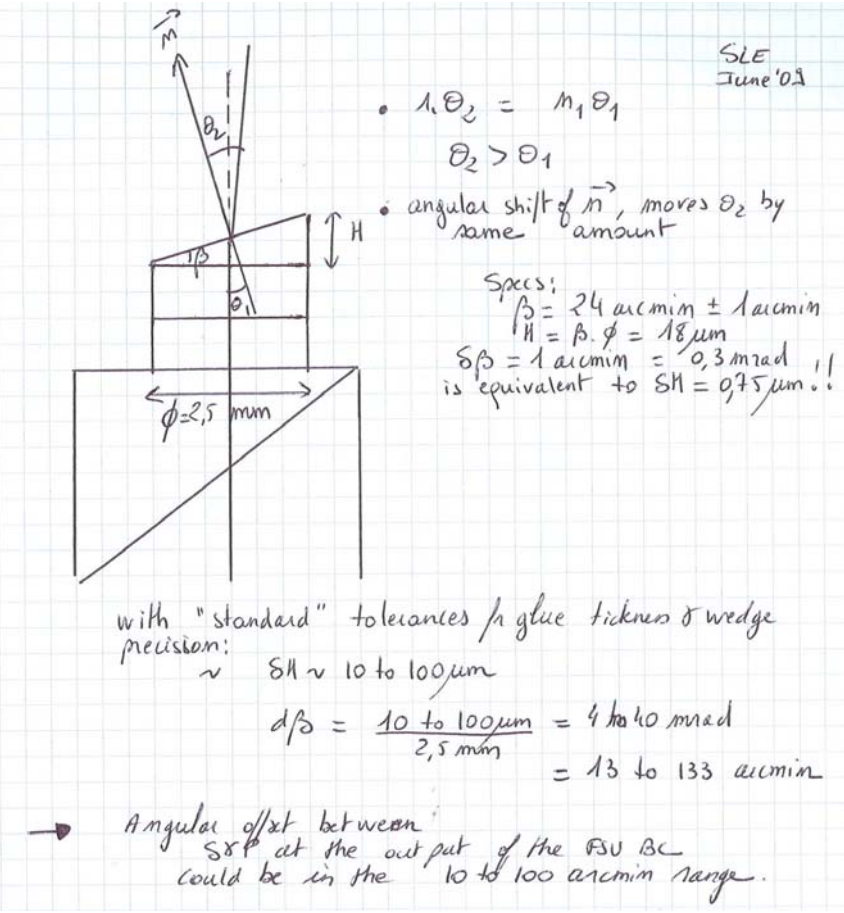
note:

On Friday 27/3 (i.e after the alignment described above), we checked the position of the DL straylight and of the PRIMET straylight from IP2-SW#2/BC-M16-DL#4/2AT
we used:
DL VCM pressure : ComputeVCMParametersATBC('UT4',4,2,7,4.5,-1)=3.79e-3
FSM: 15,15
AT-VCMB: unkown pressure and position

DL#4 metrology ghost appears on (188.5; 184.1)
PRIMET straylight (only 1 spot appears): 188.5 185.1
This indicates that both straylight beams are now aligned (as expected) but also that the position of the DL#4 metrology straylight has moved by 4.8 pixels !

Origin of the shift: different tilt of the FSM ? different pressure of the DL and STS VCm 's ? (apure tilt of the AT-VCM should not have any effect)

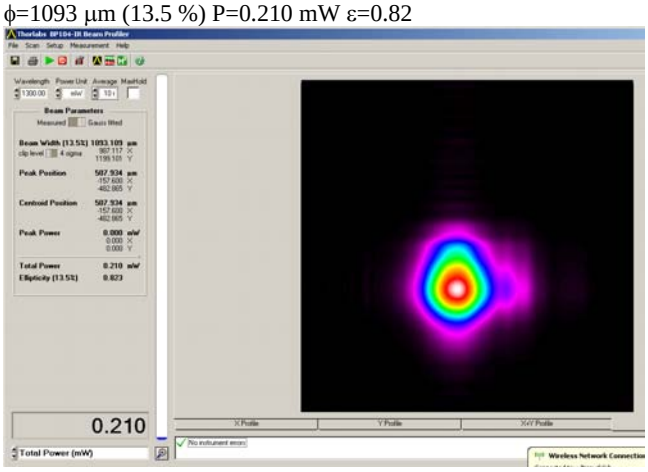
Verification of the PRIMET signals on Marcel after the realignment described above:
PRIMET fringes have a weak contrast although the flux are balanced on Ip2 and Ip4
Possible origin: lateral displacement because we can retrieve a good contrast by moving laterally a corner cube located in front on the Marcel's breadboard either on IP2 or Ip4.
The alignment corrections made in 1/ and 2/ may have shifted the PRIMET footprint on Marcel such that only part of the marcel's retroreflector is illuminated by PRIMET.
Unfortunately, this has not been checked.



5.3 Beam profile of the PRIMET IP4 beam after retro-reflection by AT#4-STSB

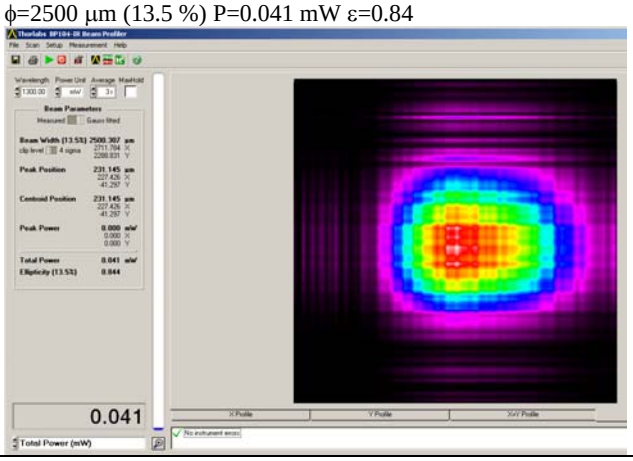
Configuration AT#4 on Ip4 (IP2 is reflected by the FSU retro-reflector)	
AT#4-STS	J2-Beam B
FSMB	15 15 (edge position 12.6;12.9) according to COM3 report)
VCMB	25.5 4.4 pressure: 1.93 bar 4.7 e-3 mm-1 (default value 4.74e-3mm-1 (1.9524 bar))
DL#4	OPL=14m VCM 3.72e-3 mm-1 =1.625 bar Instead of ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1) =3.99e-003 mm-1
M16	DL#4-4AT (to feed Beam B in ip4)
Switchyard	SW4->BC
DDL	no
Ip	**Ip4**
Primet Pol	P Quadcell 4

Beam profiler 18cm behind FSU BC
ϕ=1093 μm (13.5 %) P=0.210 mW ε=0.82



Beam profiler in front BS2 (see

Figure **3**) , i.e. shifted by 69.5 cm compared to the left picture.
ϕ=2500 μm (13.5 %) P=0.041 mW ε=0.84



Therefore, $\mathbf{T_{BS1}.R_{BS2}=0.041/0.210=0.195}$ which is consistent with the theoretical value of 0.3.0.7=0.21

On the right hand side picture, the beam profiler is further away from the pupil (larger spot) and the beam crosses BS1 and BS2 which reduces the optical flux.

Centroid 200; -100
-900 120 (ghost ip2 Retro-reflector ACU)
With density (OD3 of

Figure **3** or new OD in front of quadcell ?): 2.4 Volt on the quadcell

Initially we can pupil track on IP4
Then problem on quadcell IP4:

- the gain of the quadcell changes suddenly after being illuminated for some seconds. This problem can be temporarily solved by moving the beam away (i.e. the quadcell is not illuminated anymore). However the frequency of the problem is too large to work efficiently
- Not solved by exchanging the 3HE analog module
- Already experienced during COM3
- Cannot perform reliable beam tacking on IP4

In order to continue working, we change the M16 configuration to feed IP2 to the AT-STS and operate quad ip2 instead

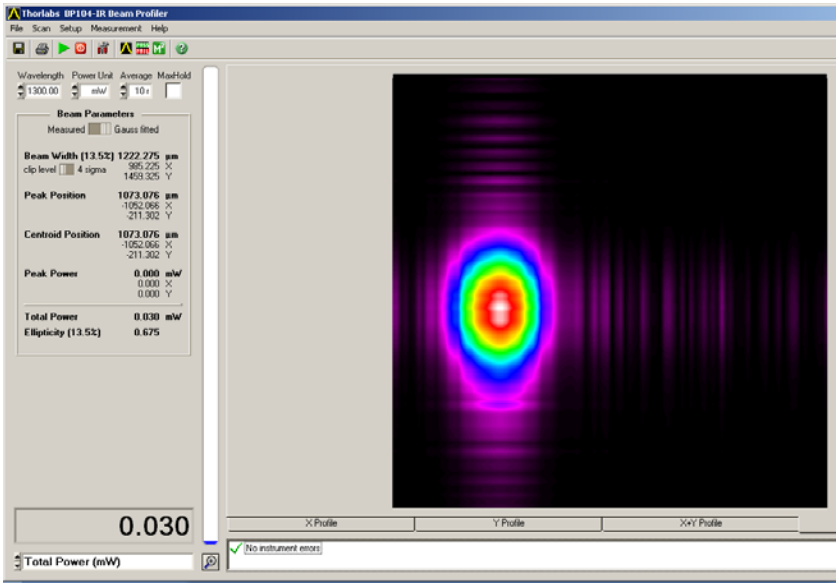
5.4 PRIMETB pupil tracking on IP2 with AT#4-STSB

M16->2AT and adjust the DL-VCM pressure and the STS-VCM position by looking at the spot on the beam profiler located after BS2

Configuration AT#4 on Ip2	
AT#4-STS	J2-Beam B
FSMB	15 15 (edge position 12.6;12.9) according to COM3 report)
VCMB	25.5 2.2 pressure: 1.93 bar 4.7 e-3 mm-1 (not changed (default value 4.74e-3mm-1 (1.9524 bar)
DL#4	OPL=14m VCM 4.09e-3 mm-1 =1.8 bar Instead of ComputeVCMParametersATBC('UT4',4,2,7,4.5,-1) =3.80e-003 mm-1 (compared to section 5.3, i.e.observation with IP4, the theory tells us that we should reduce the curvature, but in reality we have increased it)
M16	DL#4-2AT (to feed Beam B in ip2)
Switchyard	SW4->BC
DDL	no
Ip	**Ip2**
Primet Pol	S Quadcell 2

Result on the beam profiler located in front of quad-ip2

ϕ=1222 μm (13.5 %) P=0.030 mW ε=0.68



the beam nicer than for IP4 (see previous section ? or did we look at the profile in front of the injection bloc ? but the power 0.030 would be too low.

Alignment of quad ip2 in the lab:
The quadcell position is adjusted by looking at the flux and radial position of the spot coming back from AT#4 on the rtd scope of pmpsdgui.

From control room:
Better centering found for VCM (25;2), after the beam has drifted due to turbulence.

Again need to change the sign in the interraction matrix: it works with -1 0 0 -1 (inverted compared to Ip4 on quad-ip4)

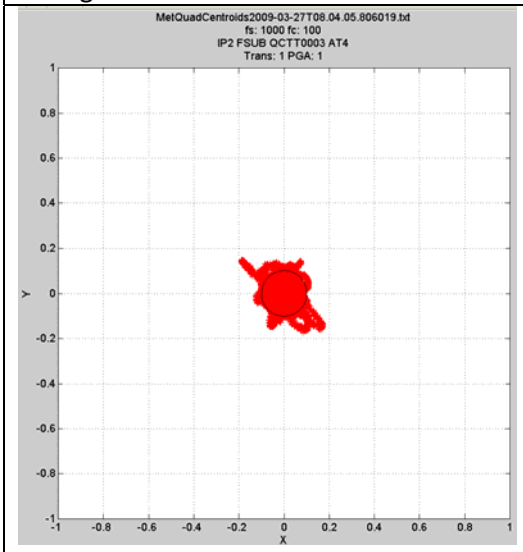
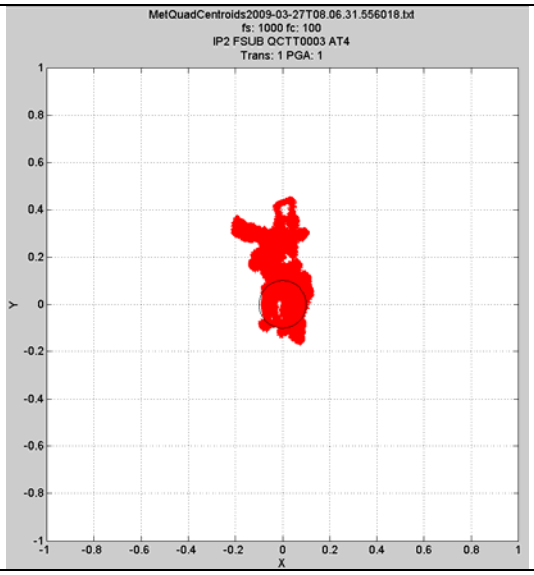
Then we swap back to quad IP4 looking at STS-VCM B
We manage to track on X avec IM 1 0 0 0
But not on Y….whatever the sign of the conversion matrix on Y, although it worked before (see previous section) beam deformation due to vignetting too large?? wrong VCM position after beam drift ?

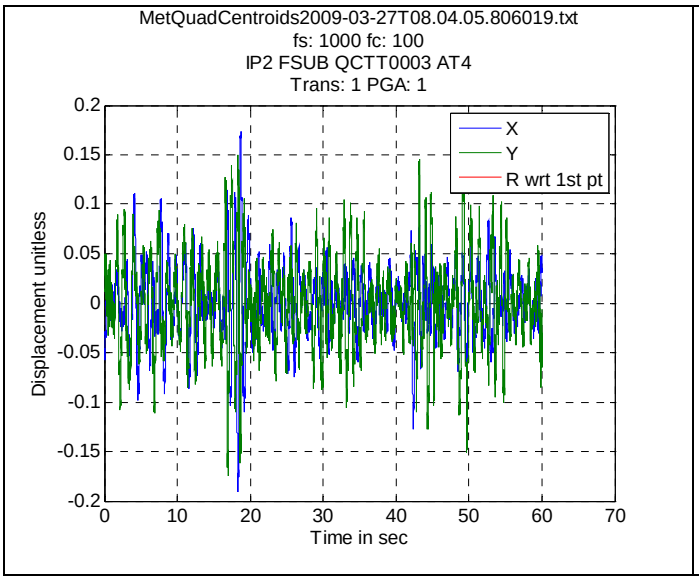
We come back to quad Ip2 on AT#4 (2AT)
Vcm 25 ; 2.2
Fsm 12.9 ; 12.7
Vcm dl (STS ???) at 1.8 bars -> 4.09e-3 mm-1
SUM on quadcell 2Volt

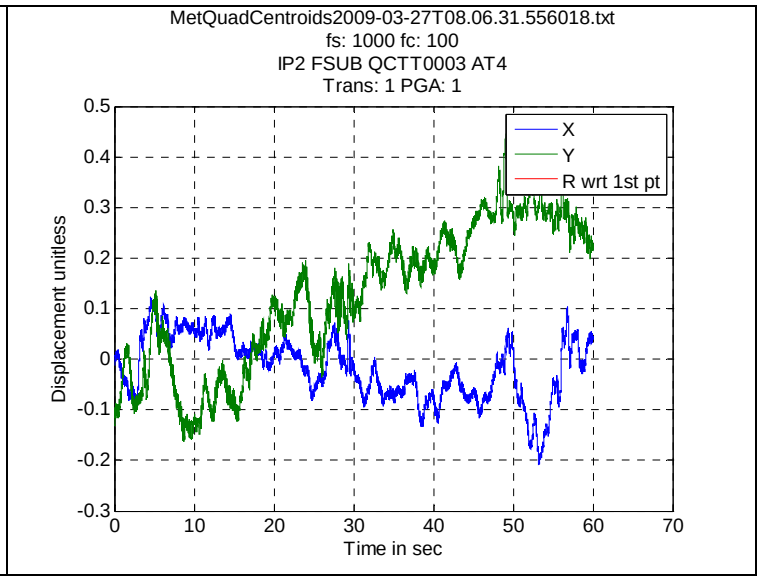
➔ **Pupil traking is working fine on IP2**

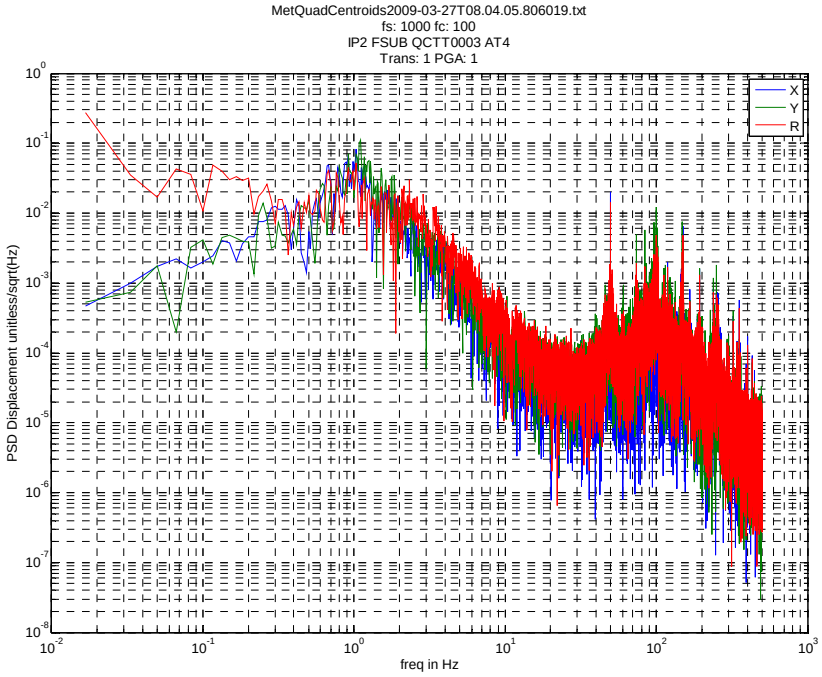
5.5 PRIMETB Beam Tracking (BTK) tests on IP2

Robert changed the engineering files to record the DemodX and DemodY in the centroids files
Enclosure closed

Closed loop gain=-0.015 IM -1 0 0 -1 (rest is the same as before) Centroids27T08.04.05 Pk= 2.733628e-001 p rms= 3.319545e-002 p: High residuals….dominated by eigen frequency in the 1 Hz region	Open loop: Centroids27T08.06
	





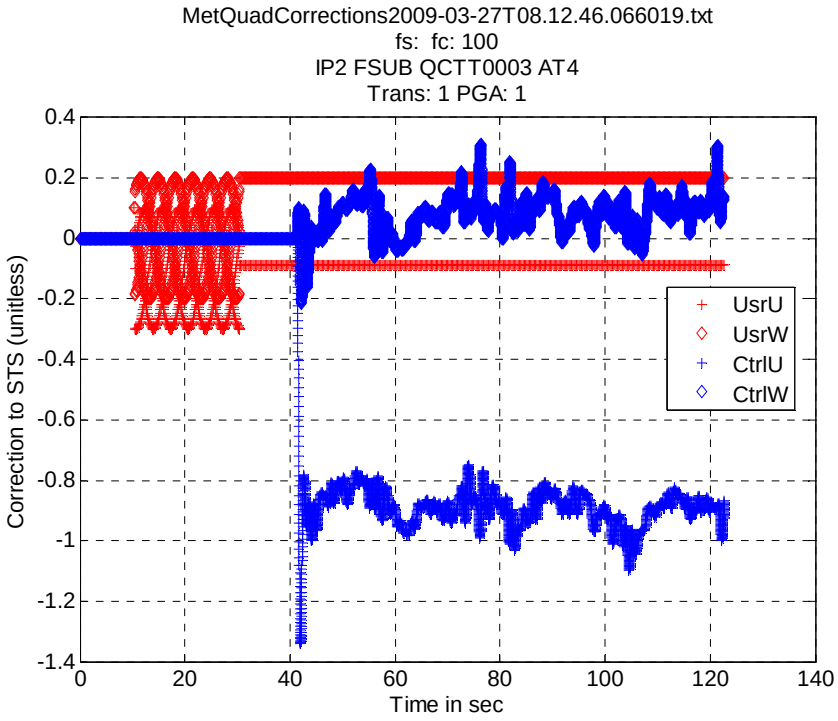


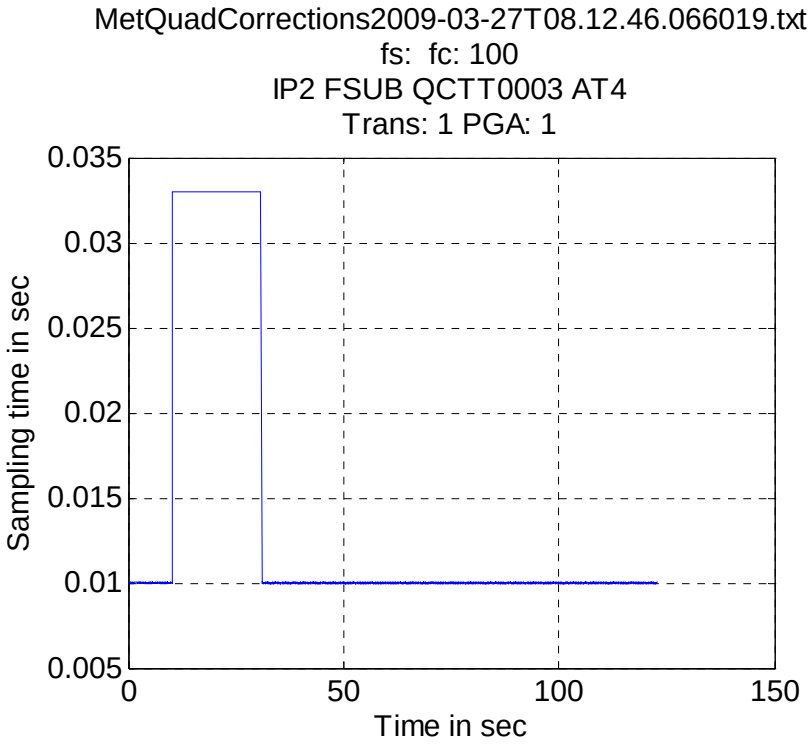
Operational test

Offset the beam (but not completely out of quadcell, such that "*beam search*" is directly successful and that we go directly for the 20 sec circular modulation

Starting file

Beam search
StartMPO
Centroids27T08.12.05





➔ It seems that sampling is reduced during modulation as it is during beam search. To be checked and fixed by RFR.

Beam Tracking Tests

Inititially the modulation stops after 20 sec !!

Beam centered initially :

beamDetAmplitude=0.2

beamdetFrequency=10

BeamdetFilterTau=0.5

Centroids27T08.22: modulation sent at sampling of 0.033 sec(30 Hz)

Centroids27T08.25

beamDetAmplitude=0.15

Centroids27T08.29

beamDetAmplitude=0.10

Centroids27T08.30

beamDetAmplitude=0.10 with initial manual offset of 0.5 along U

Centroids27T08.33

beamDetAmplitude=0.10 with initial manual offset of 0.3

Centroids27T08.38

beamDetAmplitude=0.10 with initial manual offset of 0.2

Centroids27T08.41

Center manually the beam,
set modulation time to 120 sec and let the beam drift naturally
beamDetAmplitude=0.10 and beamDetFilterTau=1
Centroids27T08.54
Start modulation, record engineering file and send manual offset step 0.15 every ~ 5 sec along W
Centroids27T09.01

Conclusion:

A more detailed analysis of the data (after COM4) showed the commands sent to the VCM to generate the beam circular modulation have a phase shift. So practically, we did not follow a circle but we jumped between points separated by 120 deg and located on the same circle. The recorded data are useless.

Some recommendations for later tests:
The modulation amplitude should not exceed ~0.1 to 0.15
Need to explore DemodX and DemodY for different beam position in a single file.

1. center the beam
2. start modulation (large modulation time)
3. Offset manually the beam
4. plot(X,demodX) plot(Y,demodY) plot(RPos,demodX-demodY) and look at correlation

6 FRIDAY 27/3: CYCLOP MODE ON IP4 OR IP2, WITH RETRO FSU, NO LASER FREQ STABILIZATION

6.1 Test on IP2 with SW#2-BC

same configuration as yesterday on IP2, except that the FSM is closer to its edge position

Configuration AT#4 on Ip2; Enclosure closed (until section 6.6)	
AT#4-STS	J2-Beam B
FSMB	12.9 ; 12.7 close to edge (edge position 12.6;12.9) according to COM3 report:
VCMB	25.5 2.2 pressure: 1.93 bar 4.7 e-3 mm-1 (not changed (default value 4.74e-3mm-1 (1.9524 bar)
DL#4	OPL=14m VCM 4.09e-3 mm-1 =1.8 bar Instead of ComputeVCMParametersATBC('UT4',4,2,7,4.5,-1) =3.80e-003 mm-1
M16	DL#4-2AT (to feed Beam B in ip2)
Switchyard	SW4->BC
DDL	no
Ip	**Ip2**
Primet Pol	S Quadcell 2

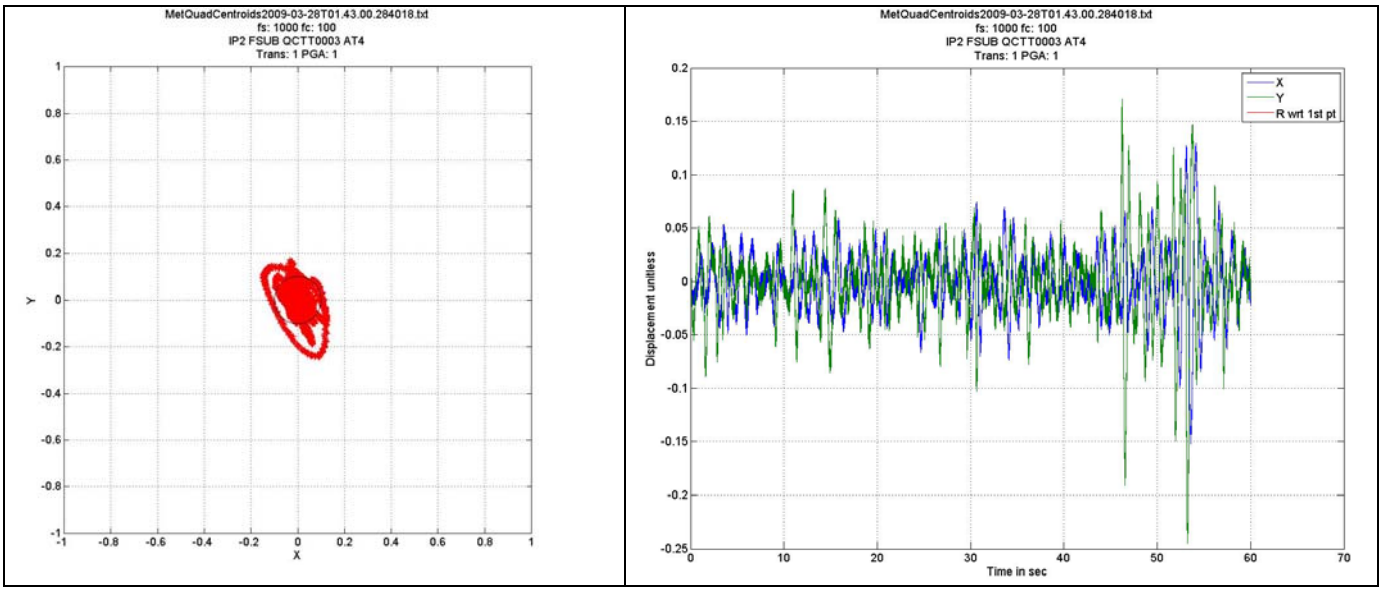
Beam detected:

- ➔ 2 Volt on the quadcell
- ➔ and 1.2 Volt on the phase meter photodiodes

Pupil tracking OK
Fringe are measured without glitches

==> Filename: lprma2PhaseMeter2009-03-28T01.42.39.txt
Sampling frequency= 500 Hz
Number of samples= 60000 (120 seconds)
DeltaL Mean= -3.118286e-006 m
DeltaL PV= 1.391840e-005 m
DeltaL rms= 3.659142e-006 m
Status Not OK: 0
DeltaL rms above f_cut= 5 Hz= 5.921772e-008 m

===>MetQuadCorrections2009-03-28T01.43.00.284018.txt'LprmpdXX28T01.43
closed loop
again disturbance in the 1 Hz region + larger kick towards the end
Pk= 27 % rms= 3%



6.2 Test on IP2 with SW#2- BC-DDL8

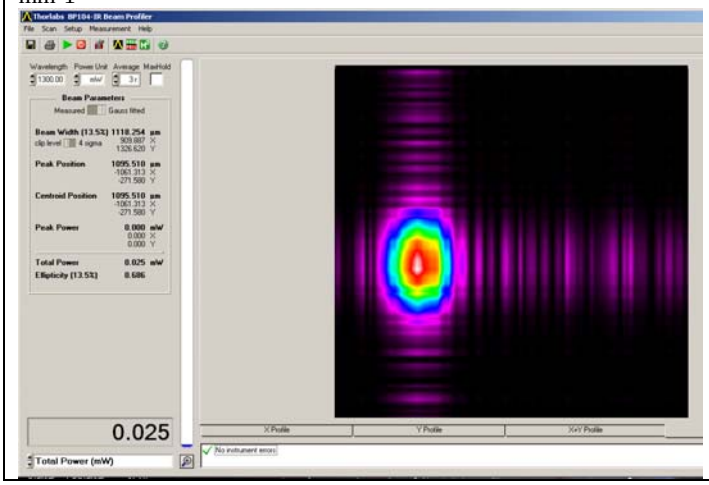
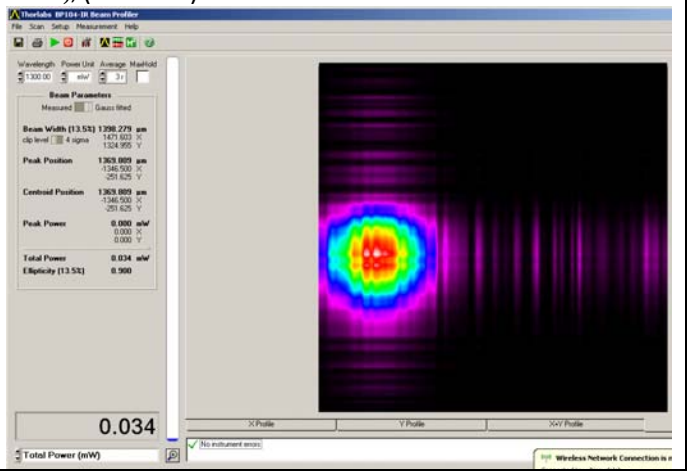
6.2.1 Beam profiles and data recording

Try to go trough DDL:
First adjust VCM pressure to remove the offset of 4.5 m
ComputeVCMParametersATBC('UT4',4,4,7,0,-1)= 5.820640e-004 mm-1
(as described below, we realized that the theoretical curvature of the DL was wrong, we should have taken:
ComputeVCMParametersATBC('UT4',4,2,7,0,-1)= 3.816134e-004 mm-1)

Set the STS-VCM to the value of COM3: VCMB (23.1; 5.7)
Start beam search: beam found at offset 3.7 and -1.2
Then BTK modulation of 0.2 started

Beam search OK
New VCM position for centered beam (27.6 ;7)
but cannot close the loop

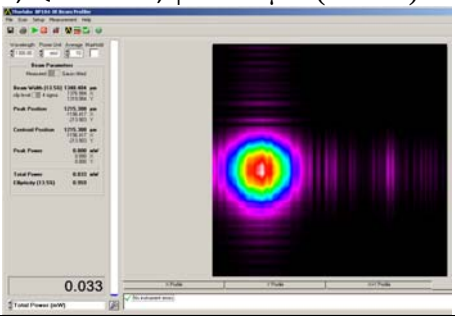
➔ We go in the lab and look at the spot

Wrong theoretical DL pressure before ComputeVCMParametersATBC('UT4',4,4,7,0,-1)= 5.820640e-004 mm-1	Correct theoretical pressure ComputeVCMParametersATBC('UT4',4,2,7,0,-1)= 3.816134e-004 mm-1), (0.12 bar)
	

New value of the VCM

Close loop BC-DDL with IM -1 0 0 1 !!! different from Close loop in BC (-1 0 0 -1)

Finally:

Configuration AT#4 on Ip2	
AT#4-STS	J2-Beam B
FSMB	12.9 ; 12.7 close to edge
VCMB	27.6 ;6.7 (or init value + (8.3 -12.3)) pressure: 1.93 bar 4.7 e-3 mm-1 (not changed (default value 4.74e-3mm-1 (1.9524 bar)
DL#4	OPL=14m VCM 3.8e-4 mm-1 =0.12 bar (=theoretical value) ComputeVCMParametersATBC('UT4',4,2,7,0,-1)= 3.816134e-004 mm-1)
M16	DL#4-2AT (to feed Beam B in ip2)
Switchyard	SW4->BC-DDL8
DDL	no
Ip	**Ip2**
Primet Pol	S, Quadcell 2; ϕ=1348 μm (13.5 %) P=0.033 mW ε=0.96 

By comparing with section 5.4, we see that the quality of the metrology beam is not degraded by the DDL (the ellipticity was even improved by DDL8, unless less effort had been spent to optimize the pressure of the DL-VCM in section 5.4)

Record fringes and pupil eng files

Metquadcentroids28T02.55

Closed loop

Pk= 16 % rms= 2.2 %

Phase Meter Data

==> Filename: lprma2PhaseMeter2009-03-28T02.55.12.txt

Sampling frequency= 500 Hz
Number of samples= 120000
DeltaL Mean= 4.665349e-006 m
DeltaL PV= 9.163400e-006 m
DeltaL rms= 1.427424e-006 m
Status Not OK: 0
DeltaL rms above f_cut= 5 Hz= 5.791584e-008 m

Metquadcentroids28T03.00

closed loop

Pk= 23% rms= 2.4 %

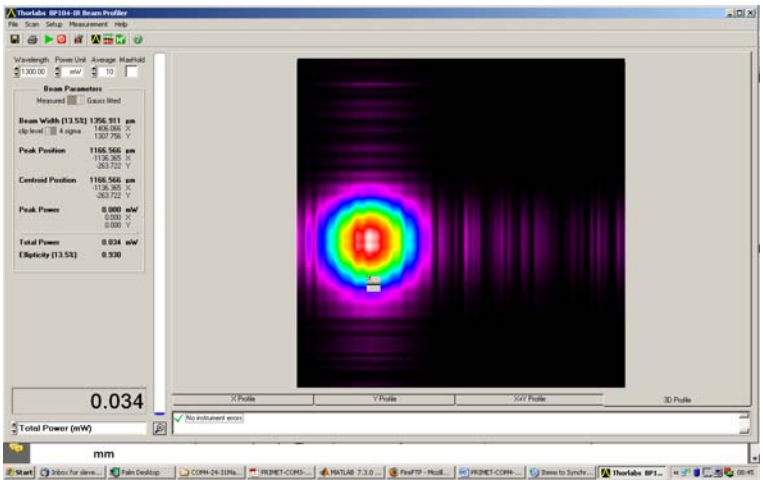
CHECK IF CONTROLLER IS SLOWER THAN COM2-COM3

Lprma2PhaseMeter28T03.00

EMPTY FILE…

6.2.2 Verification of the encoder position of SW#2-BC-DDL8

SW#2 BC-DDL8 : enc:230404
We observe a slight beam shift of 5 mm at the output of the lab.
We move by -40 encoders to 230365
The spot is well centered at the entrance of the light duct J2
The returned spot is slightly shifted and we compensate by moving the STS-VCM to (26.33 7.08)
and bring the beam on the Beam profiler .



Pupil tracking loop is closed.

Verification of the amplitude of the angular shift of the switchyard:

The angular shift of SW#2 represents 40 encoder
Using 10000 enc mirroir/deg, we find :
0.004 deg->14.4arcsec_mirroir, i.e 28.8 arcsec_beam or 2 pixels on IRIS

On the AT-TCCD, the shift of SW#2 moved the PRIMET straylight spot from (190.5 193.2) to (188 193.7)
ΔX=2.1pixels (TCCD scale of 6pixels/arcsec_sky), ΔX=35arc_sec_lab= or 2.5 pixels on IRIS
This is consistent.

Note: Iris and the AT-TCCD have a comparable pixel scale (~16% difference)

IRIS:	140marcsec_sky/pix or 1 arcsec_sky=7 pixels
AT-TCCD:	166marcsec_sky/pix or 1 arcsec_sky=6 pixels

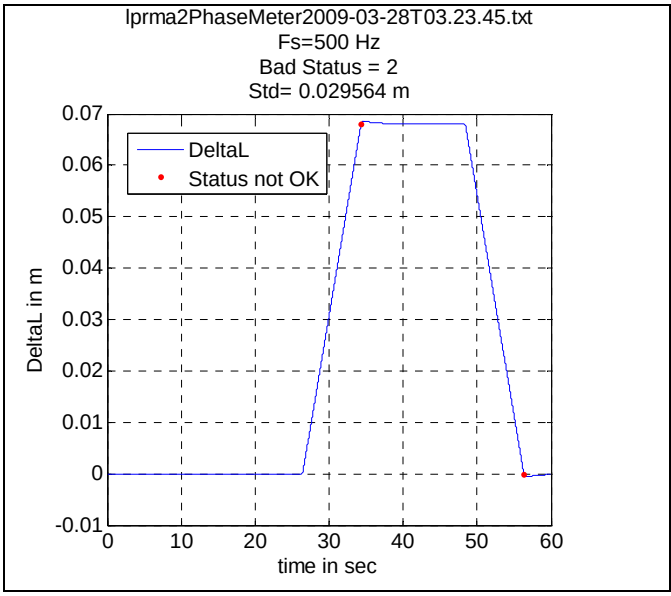
6.3 Impact of the motion of DDL8 (IP2)

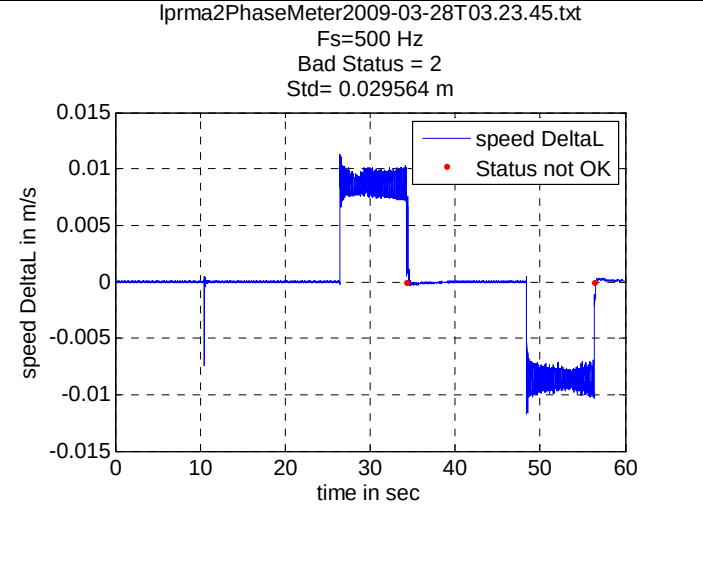
For the tests reported in this section, SW#2 was in position BC-DDL8 as saved in the DB (i.e 230404) and not at the more appropriate position (enc 230365)

Mechanical Stroke of the DDL -35000 to 35000 microns
(-> positive towards +U direction inside the VLTI Lab)

Sequence: Online setapos34000 setapos0 (mechanical position: Check)
Lprma2PhaseMeter28T03.23
****
Phase Meter Data

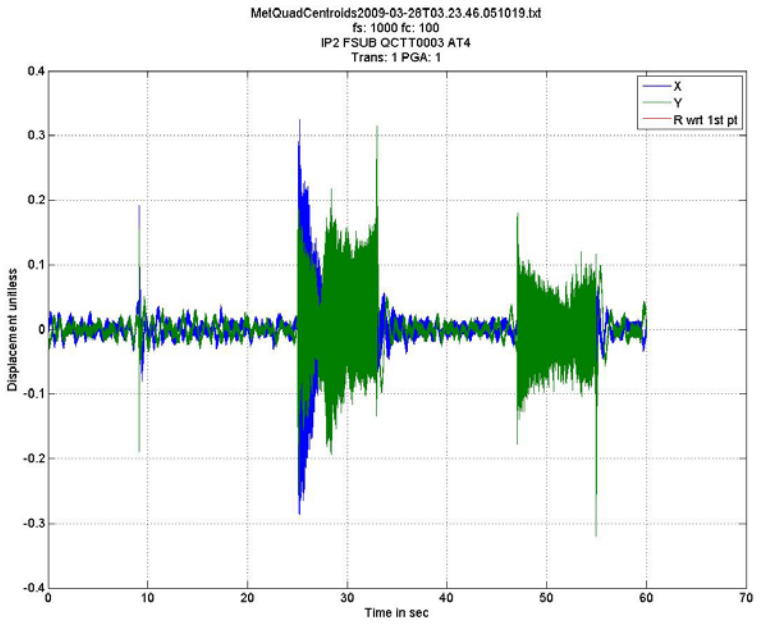
==> Filename: lprma2PhaseMeter2009-03-28T03.23.45.txt
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL Mean= 2.491778e-002 m
DeltaL PV= 6.916649e-002 m (twice as mechanical position)
DeltaL rms= 2.956426e-002 m
Status Not OK: 2 (450 kHz probe lost)





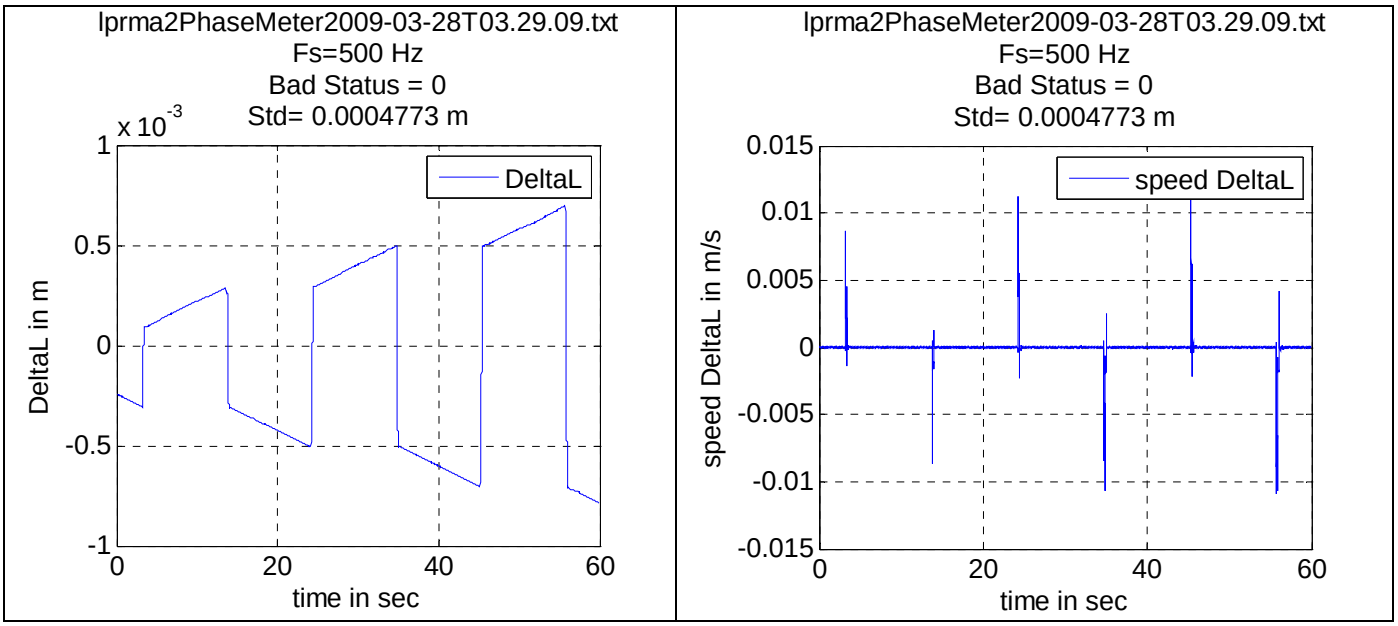
OPL speed: 69mm/8sec=8.625 mm/sec << phase meter specs of 23 mm/sec
Glitch corresponds to the end of the SETAPOS sequence, when large shift of the beam along Y occurs (see centroid file below)
Does this correspond to correction of M3 ?

Metquadcentroids28T03.23
During trajectory change: essentially disturbance along Y (M3 does not cope with preset speed ?)



Simulate Fringe search:

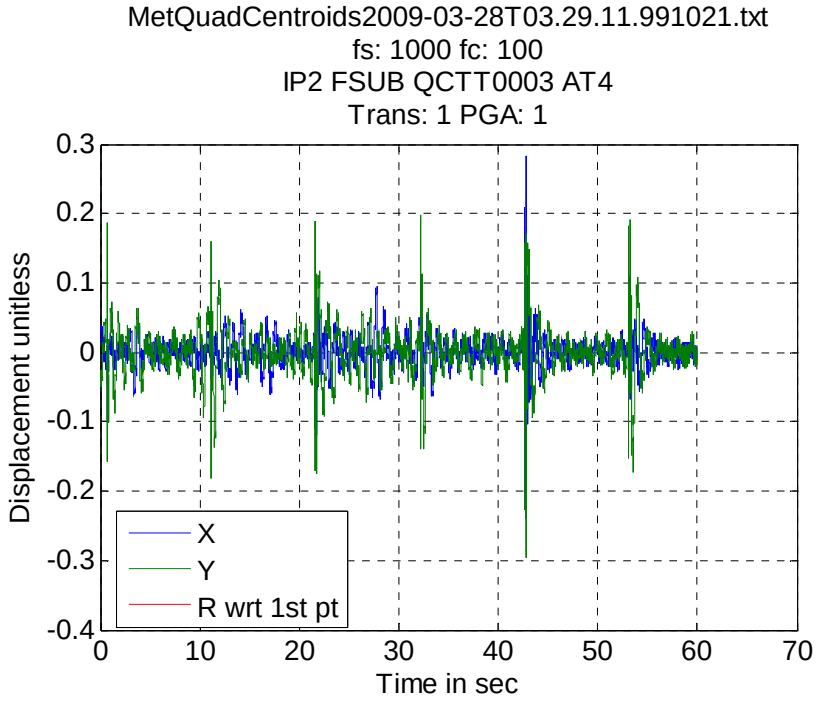
Lprma2PhaseMeter28T03.29



==> Filename: lprma2PhaseMeter2009-03-28T03.29.09.txt
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL Mean= -3.756218e-005 m
DeltaL PV= 1.482236e-003 m

DeltaL rms= 4.772975e-004 m
Status Not OK: 0

Metquadcentroids28T03.29
Closed loop



The change of the search direction introduces large lateral beam displacement (mainly along Y) which cannot be corrected by the pupil tracker.
No glitch occurred in the particular case shown above, but because IP4 is retro-reflected by the FSU retro-reflector, the beam overlap was always excellent.
In real operating conditions, this pupil motion introduced during fringe search may represent a show stopper.

Inject atmospheric noise
Lprma2PhaseMeter28T03.42
Metquadcentroids28T03.42

msgSend lddopdc tacServer MODBLCK « WhiteNoise,0,10,12345 »
(10 times larger than std 1)
Lprma2PhaseMeter28T03.48 :
EMPTY FILE !!!!
no proof that the noise was really injected apart that I remember that it was…
Metquadcentroids28T03.48
Pk= 13 % rms= 2 % (Good)

After we stop pupil tracking
We change M16-> to 4AT

- We still detect fringes !! strange ? crosstalk ? did we really measure the right signals…..

I checked on the OPD file that primet measured the DDL displacement

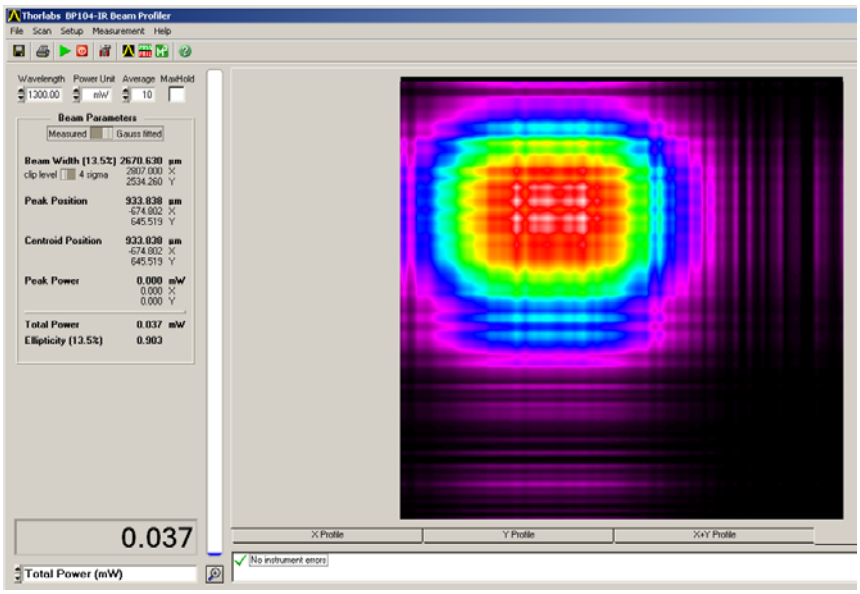
6.4 Spare quadcell mounted on IP4 and test BC with SW#4-BC

Using the same parameters as yesterday (see section 5.3)

Configuration AT#4 on Ip4	
AT#4-STS	J2-Beam B
FSMB	15 15 (edge position 12.6;12.9) according to COM3 report)
VCMB	25.5 4.4 pressure: 1.93 bar 4.7 e-3 mm-1 (default value 4.74e-3mm-1 (1.9524 bar))
DL#4	OPL=14m VCM 3.72e-3 mm-1 =1.625 bar Instead of ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1) =3.99e-003 mm-1
M16	DL#4-4AT (to feed Beam B in ip4)
Switchyard	SW4->BC
DDL	no
Ip	**Ip4**
Primet Pol	P Quadcell 4

➔ we retrieve the same beam quality as yesterday (see 5.3)

ϕ=2670 µm (13.5 %)
P=0.037 mW
ε=0.90



We manage to track on X with IM 1 0 0 0
But not on Y….whatever the sign of the conversion matrix on Y….

➔ Same situation as yesterday

CHECK WHY
beam deformation due to vignetting too large?? wrong VCM position after beam has drifted ?

6.5 Test with IP4 SW#4-BC-DDL7

Configuration AT#4 on Ip4 (IP2=shutter of the FSU)	
AT#4-STS	J2-Beam B
FSMB	15 15 (edge position 12.6;12.9) according to COM3 report)
VCMB	25.25;3.7 pressure: 1.93 bar 4.7 e-3 mm-1 (default value 4.74e-3mm-1 (1.9524 bar))
DL#4	OPL=14m ComputeVCMParametersATBC('UT4',4,4,7,0,-1)= 5.820640e-004 mm-1
M16	DL#4-4AT (to feed Beam B in ip4)
Switchyard	SW4->BC-DDL7 (enc 222000) adjusted to **221818**
DDL	no
Ip	**Ip4**
Primet Pol	P Quadcell 4

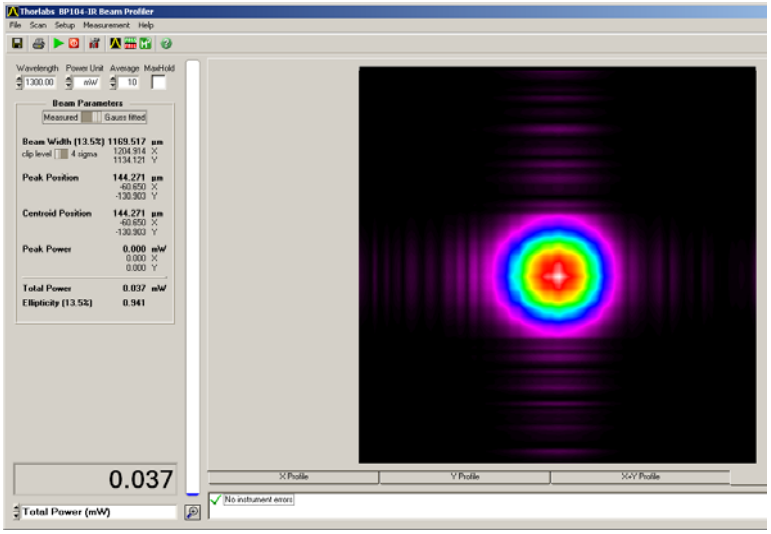
we notice that the beam is not aligned at the output of the tunnel, so we tune the SW#4 from its DB value (BC-DDL=222000) to the encoder value 221818. With this value the beam is shifted by only few mm at the entrance of the light duct and we get back get nice metrology spot :

Verification of the amplitude of the angular shift of the switchyard:

The angular shift of SW#7 represents 182 encoder
Using 10000 enc mirroir/deg, we find :
0.0182 deg->65.5arcsec_mirroir, i.e. 131.0 arcsec_beam or 9.36 pixels on IRIS !

On the AT-TCCD, the motion of SW#4 moved the PRIMET straylight spot from (196 192.2) to (185,192.2)
ΔX=11pixels (TCCD scale of 6pixels/arcsec_sky), ΔX=183arc_sec_lab= or 13 pixels on IRIS
(not completely consistent….what precision do we have on the pixel scales ?)

The retro-reflected beam is slightly shifted , we correct with the STS-VCM
STS-VCM: (25.25;3.7)



ϕ=1169 µm (13.5 %)
P=0.037 mW
ε=0.94
Again the beam looks better through the DDL !

Then, we recenter the quadcell IP4 on this spot.

Close pupil tracking loop and observe fringes:
IM :1 0 0 1
Gain=-0.015
Works fine

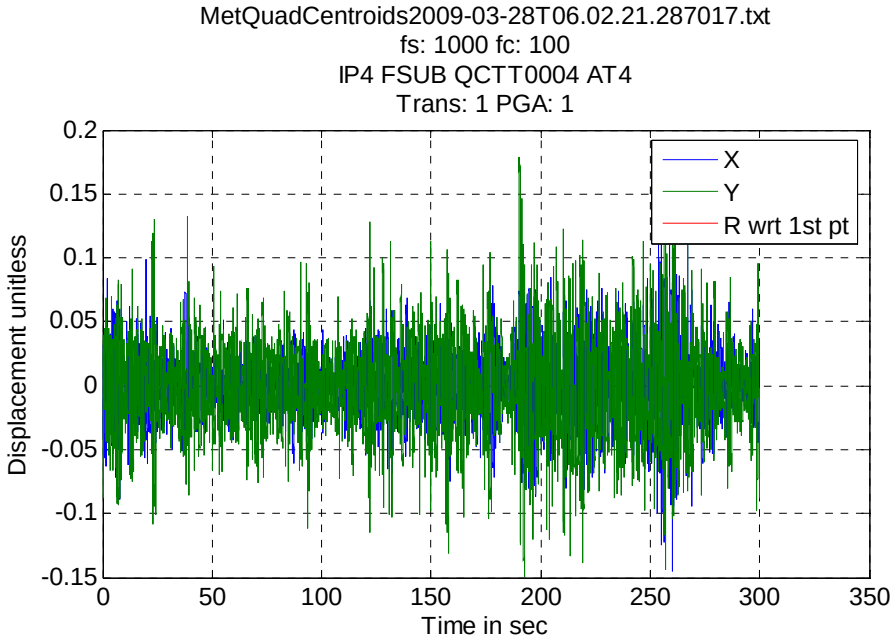
Metquadcentroids28T06.02

Pk= 19 % of ϕ (111 μm) ; rms= 2.6% of ϕ

larger PV than in the past…

(see section 4.5.2)

Is this an effect of the DDL



==> Filename: lprma2PhaseMeter2009-03-28T06.02.20.txt

Sampling frequency= 500 Hz

Number of samples= 150000 (5 min)

DeltaL PV= 8.878700e-006 m

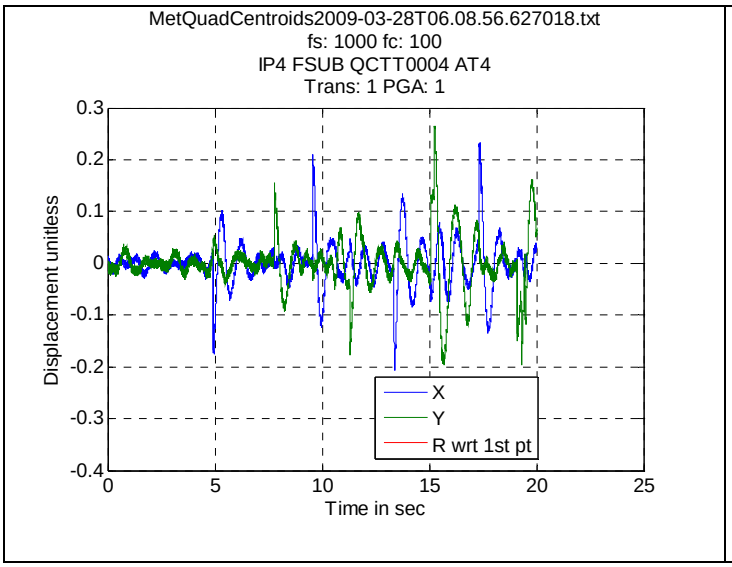
DeltaL rms= 1.885730e-006 m

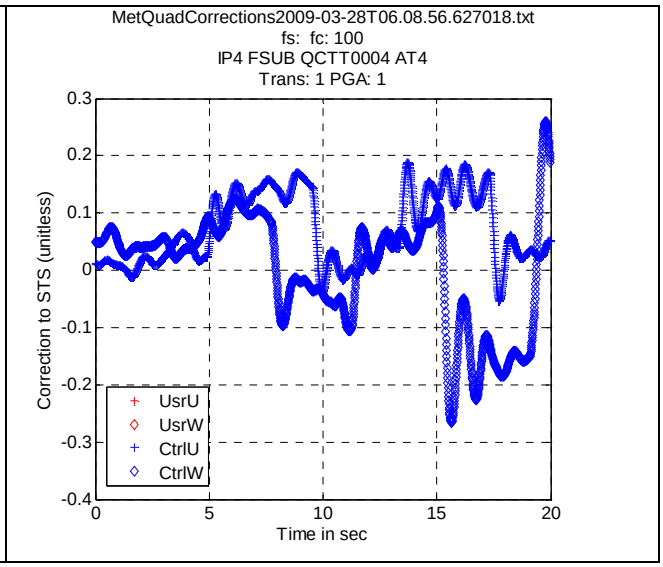
Status Not OK: 0

<u>Try disturbance of 0.1 on the STS-VCM</u>

Metquadcentroids28T06.08

Loop is stable

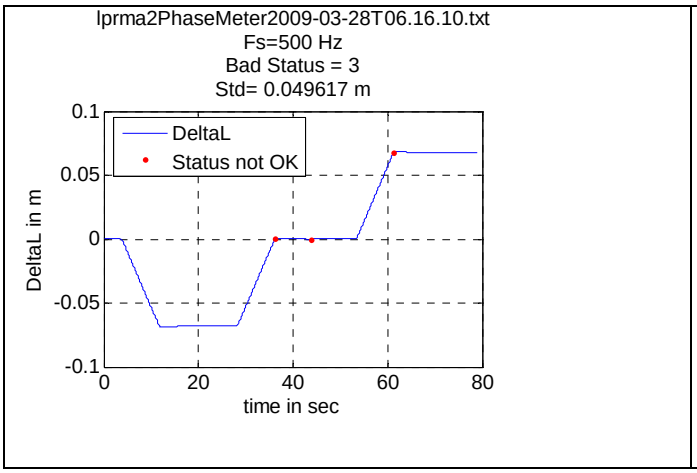


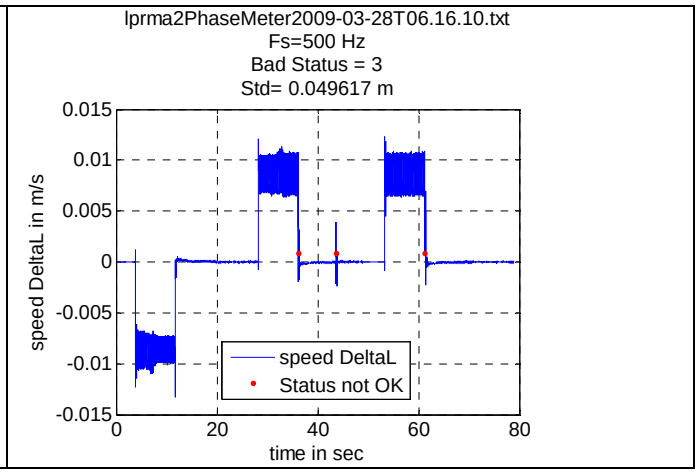


setapos34000 setapos0 setapos-34000

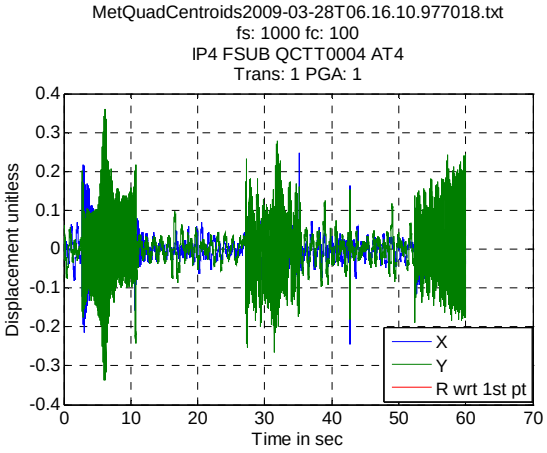
==> *Filename: lprma2PhaseMeter2009-03-28T06.16.10.txt*

Sampling frequency= 500 Hz
Number of samples= 39456
DeltaL PV= 1.371304e-001 m
DeltaL rms= 4.961663e-002 m
Status Not OK: 3





Metquadcentroids28T06.16
Pk= 39% rms= 4.5 %



setapos34000 Over full stroke from -34000 to +34000

==> Filename: lprma2PhaseMeter2009-03-28T06.20.39.txt

Sampling frequency= 500 Hz

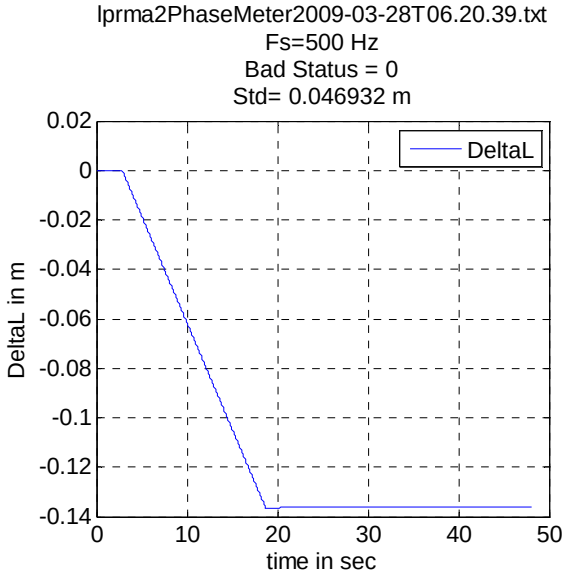
Number of samples= 24063

DeltaL Mean= -1.056395e-001 m

DeltaL PV= 1.365990e-001 m

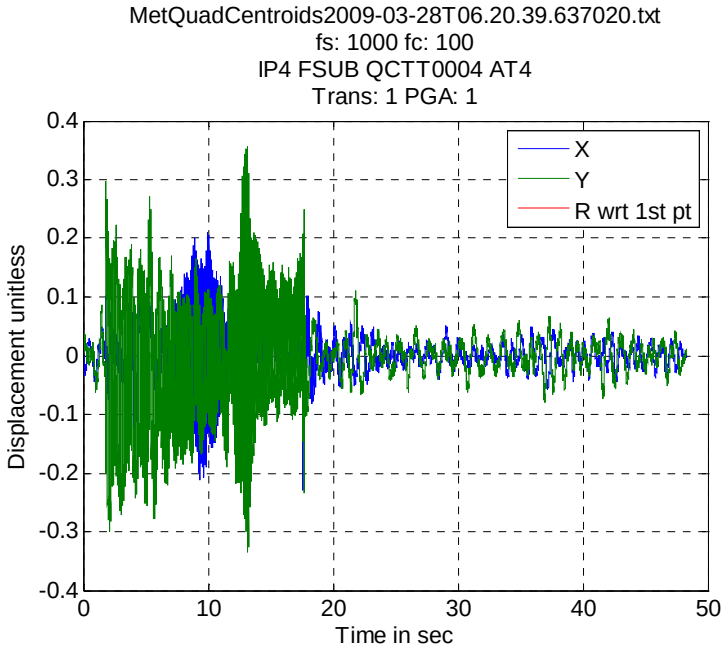
DeltaL rms= 4.693196e-002 m

Status Not OK: 0



Metquadcentroids28T06.20

Pk= 36% rms= 4.8 %



Then again but with recording in addition DDL metrology
tacReport1238221427.txt…file is overwritten
Metquadcentroids28T06.23
Pk= 48% rms= 3.8% p
==> Filename: lprma2PhaseMeter2009-03-28T06.23.42.txt
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL Mean= 1.136613e-001 m
DeltaL PV= 1.365906e-001 m
DeltaL rms= 4.163747e-002 m
Status Not OK: 0

From position +34000: setapos-34000

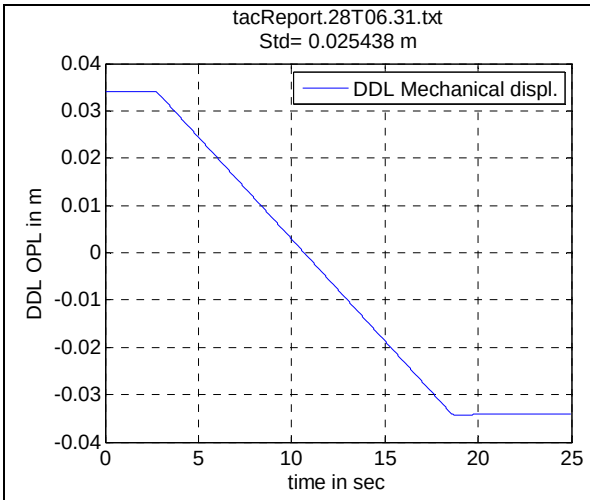
Lprma2PhaseMeter28T06.31 (500 Hz)

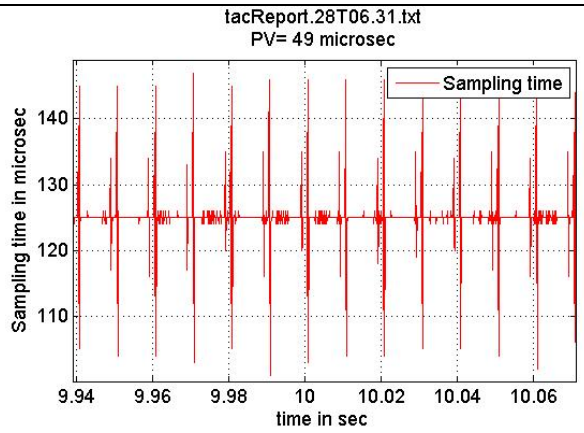
==> Filename: lprma2PhaseMeter2009-03-28T06.31.41.txt
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL PV= 1.141541e-001 m
DeltaL rms= 2.810627e-002 m
Status Not OK: 0

tacReport28T06.31 (8 kHz)

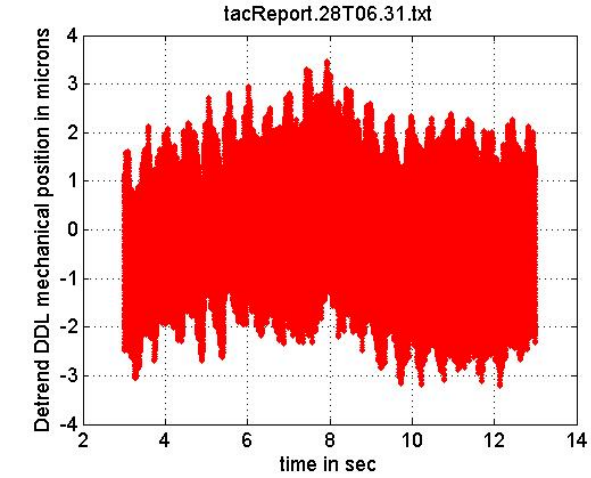
Sampling statistics in microsec
Mean= 1.250000e-004 m PV= 4.900000e-005 STD= 3.575698e-006
DDL Metrology statistics in m
Mean= -4.927464e-003 PV= 6.828298e-002 STD= 2.543833e-002
RMN Offset statistics
Mean= -2.640708e-002 PV= 6.800000e-002 STD= 2.141654e-002

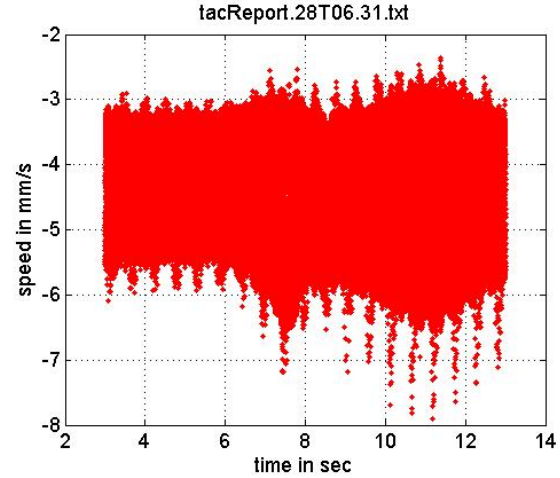
- The tacReport shows that during a preset of the DDL over the full stroke, the sampling time used to generate the trajectory exhibits a “pattern of delay” every 10msec. The trajectory error is dominated by an error of 6 microns PV at 101.9 Hz.
- The OPL recorded by PRIMET is twice the mechanical displacement recorded by the DDL in the tacReport, i.e DDL=-PRIMET/2. PRIMETB measures ΔL=(Ip3-Ip1)-(Ip4-Ip2)= 0-(Ip4-Ip2). A “positive” displacement of the DDL#7 (Ip4) corresponds to a negative PRIMET OPL (considering that there is no OPL change in IP2).
- The Lprma2 file shows a trajectory error similar to the one recorded in the tacReport: Frequency 101.9 Hz.
- After rescaling (see above) + interpolating the DDL data on the PRIMET time vector, both metrologies are compared during the first 13 sec of the motion phase. The difference of the mechanical positions also exhibits large variations at 101.9 Hz (phase shift due to interpolation?,scaling error ?).

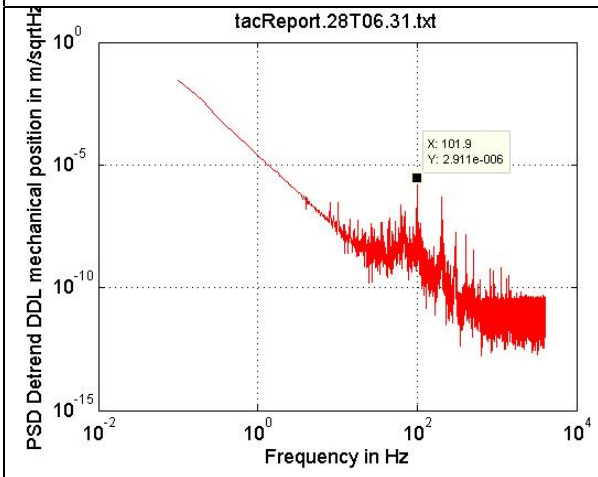


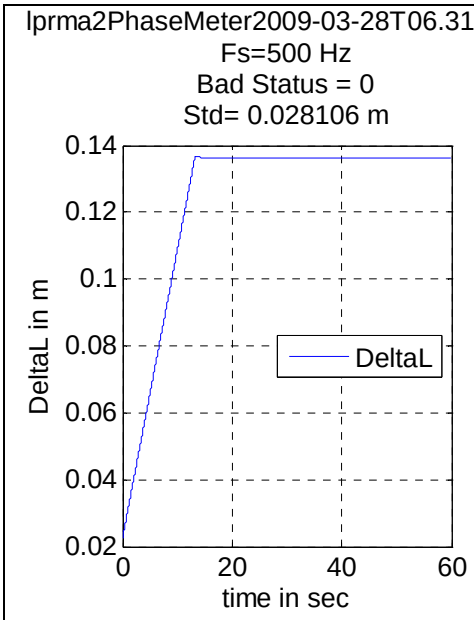


pattern of delay occur every 10 msec (100Hz)

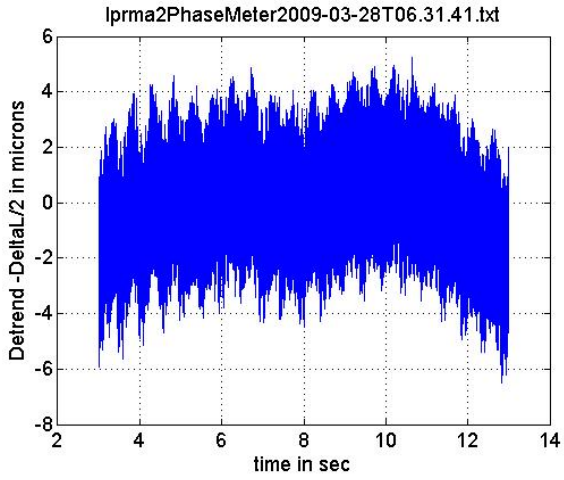


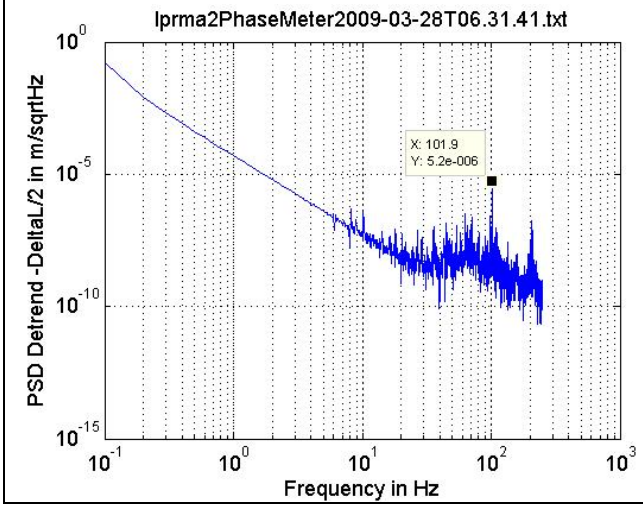


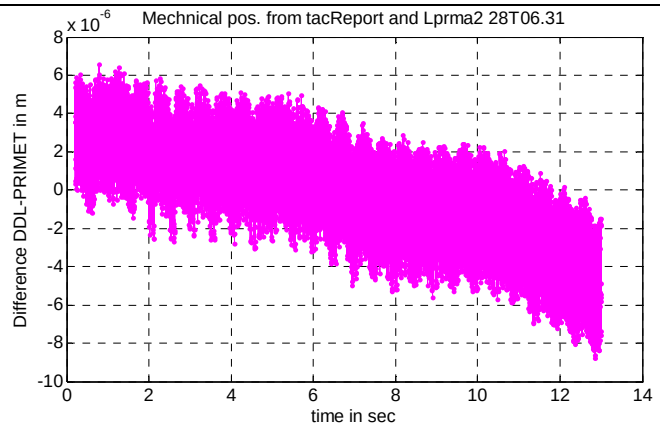




OPL recorded by PRIMET





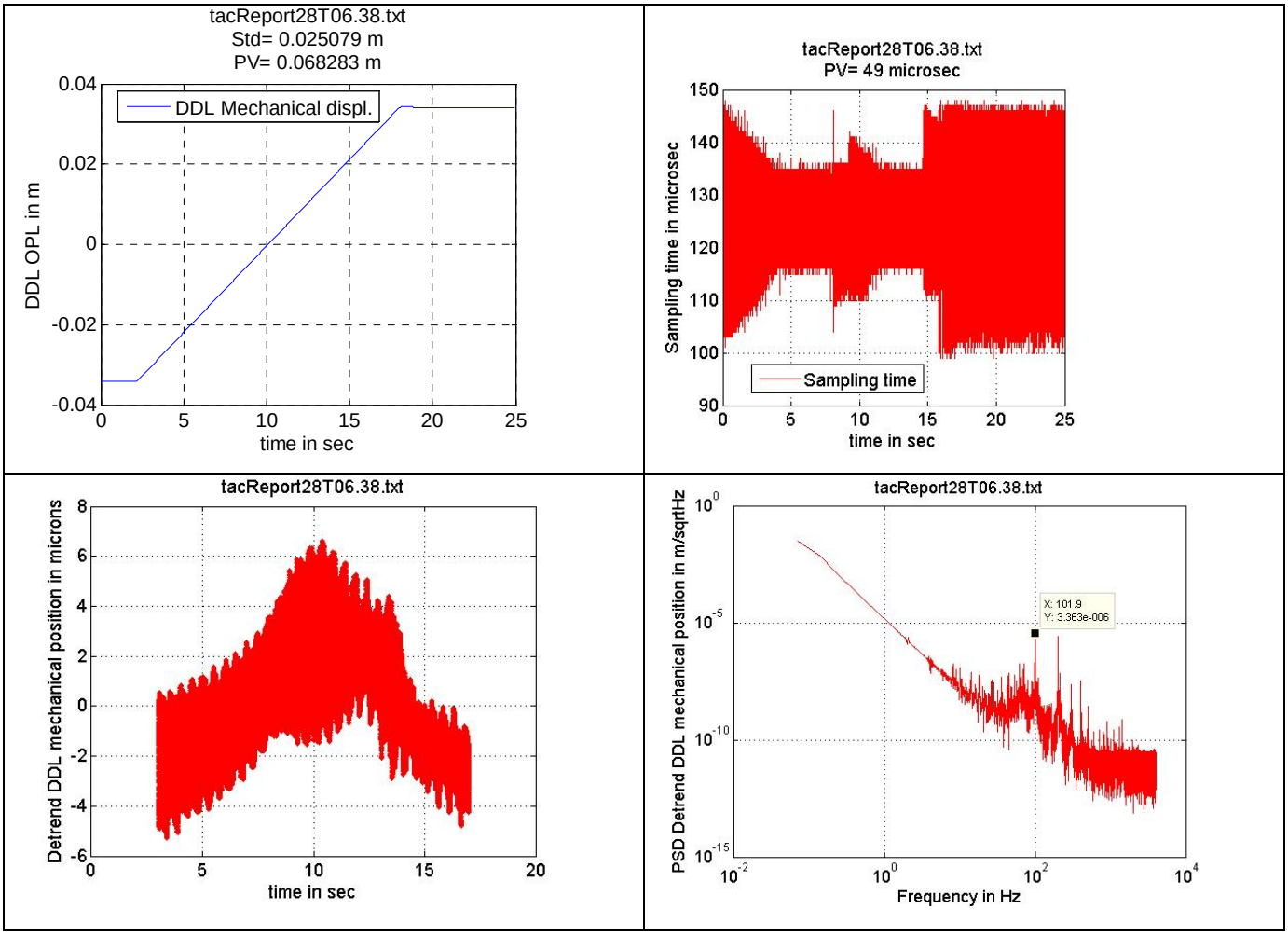


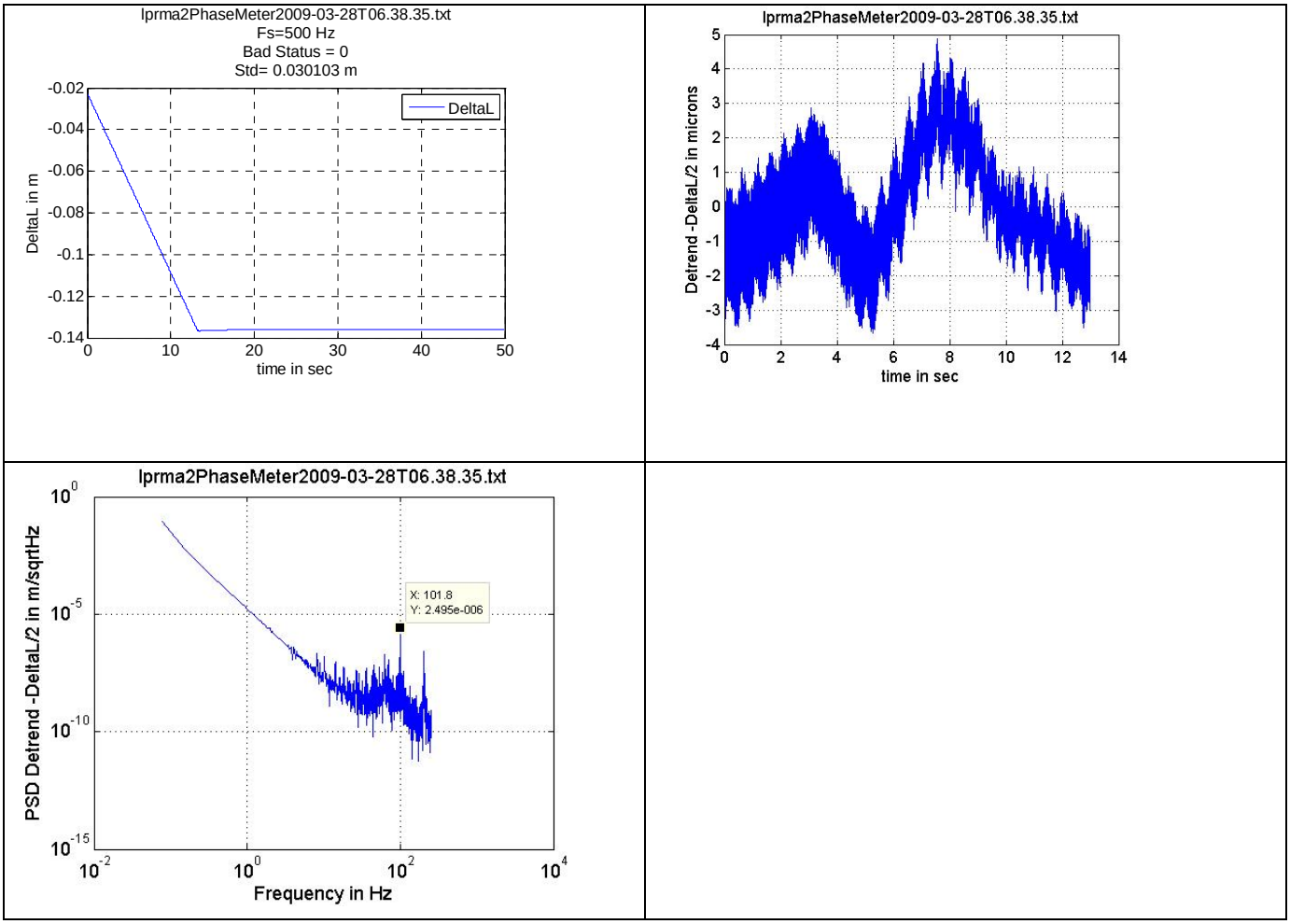
tacReport28T06.38 (8 kHz)

Sampling statistics in microsec
Mean= 1.250000e-004 m PV= 4.900000e-005 STD= 3.197611e-006
DDL Metrology statistics in m
Mean= 6.511558e-003 PV= 6.828333e-002 STD= 2.507940e-002
RMN Offset statistics
Mean= 2.798877e-002 PV= 6.800000e-002 STD= 1.930364e-002

==> Filename: lprma2PhaseMeter2009-03-28T06.38.35.txt

Sampling frequency= 500 Hz
Number of samples= 25000
DeltaL PV= 1.139548e-001 m
DeltaL rms= 3.010325e-002 m
Status Not OK: 0





Simulated fringe search:

Unfortunately no tacReport data…

Metquadcentroids28T06.45

IP4: Pk= 21 % rms= 2.2 %: not bad, dominated by residual error at 1 Hz

==> Filename: lprma2PhaseMeter2009-03-28T06.45.51.txt

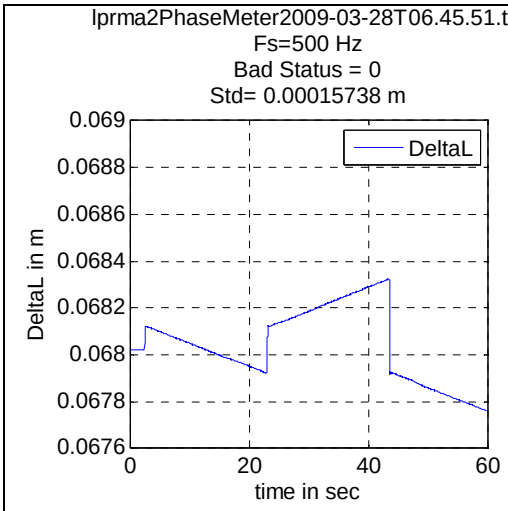
Sampling frequency= 500 Hz

Number of samples= 30000

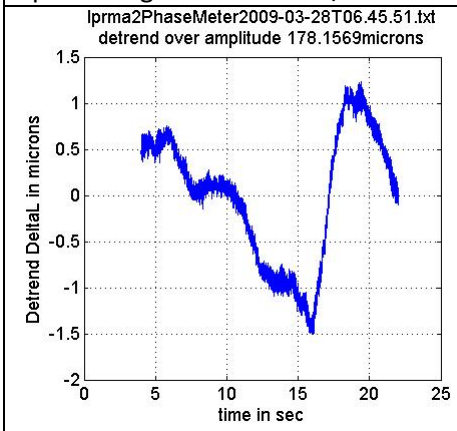
DeltaL PV= 5.625540e-004 m

DeltaL rms= 1.573798e-004 m

Status Not OK: 0

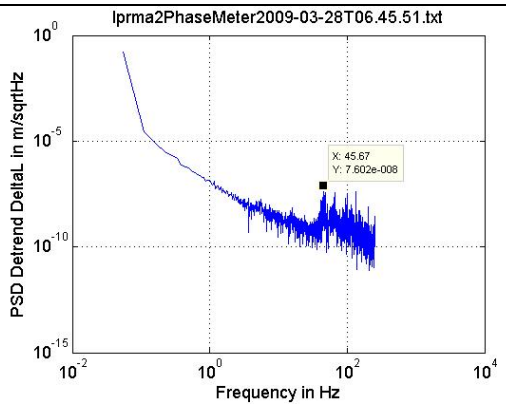


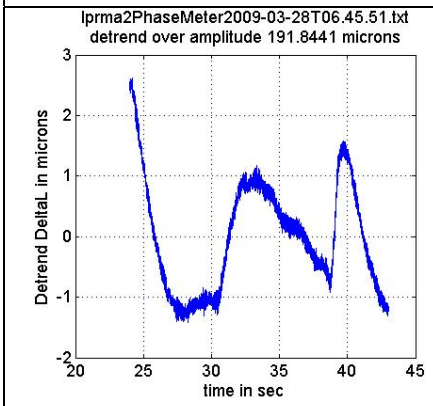
Speed fringe search: $\Delta OPL/\Delta t$=10 microns/sec



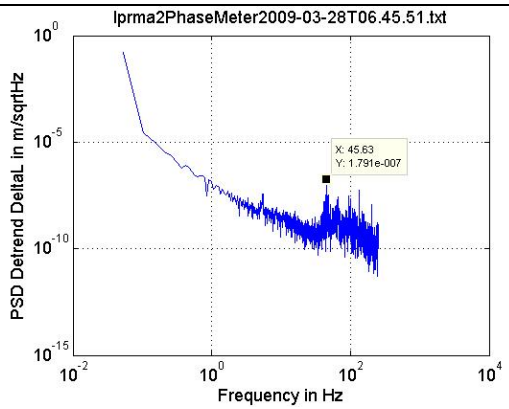
OPL error over a fringe search of 178 microns from t=4 to 22 sec: PV=500nm

high frequency OPL error dominated by PV=300nm at 45.6 Hz





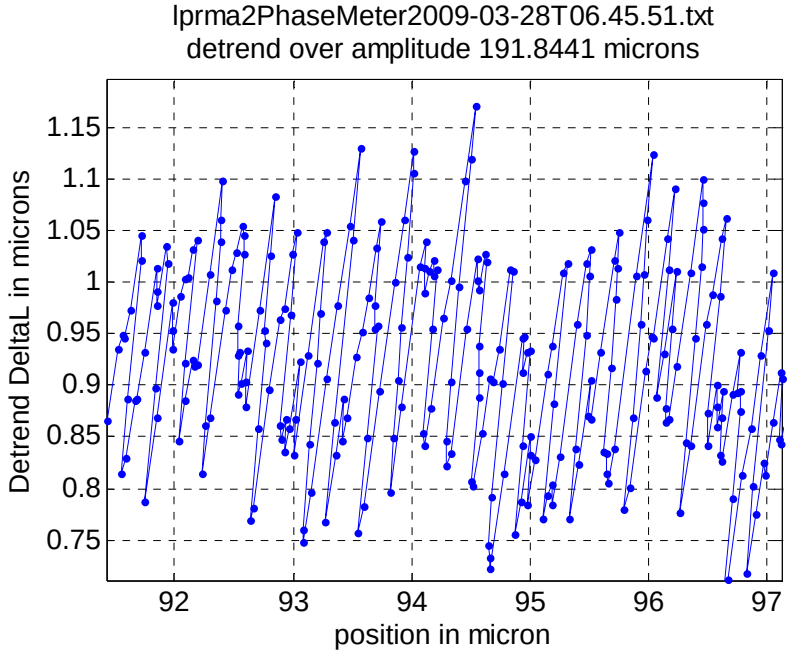
Same phenomenon on the next fringe search window (t=24 to 43 sec)



OPL error expressed as a function of the OPL (taken from fringe search t=24 to 43 sec)

➔ error of ~ 300nm PV every 225 nm

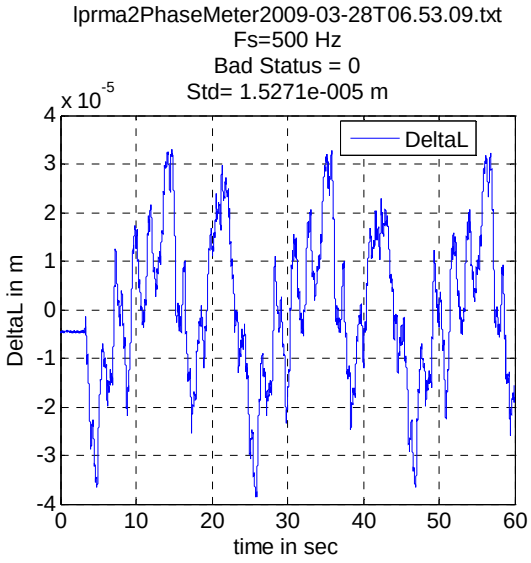
(does not look like cyclic error due to polarization leakage: indeed the signature would be at a period of λ=1319 nm)



Inject atmospheric noise:

msgSend lddopdc tacServer MODBLCK « WhiteNoise,0,10,12345 »
Lprma2PhaseMeter28T06.53

==> Filename: lprma2PhaseMeter2009-03-28T06.53.09.txt
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL PV= 7.177190e-005 m
DeltaL rms= 1.527062e-005 m
Status Not OK: 0

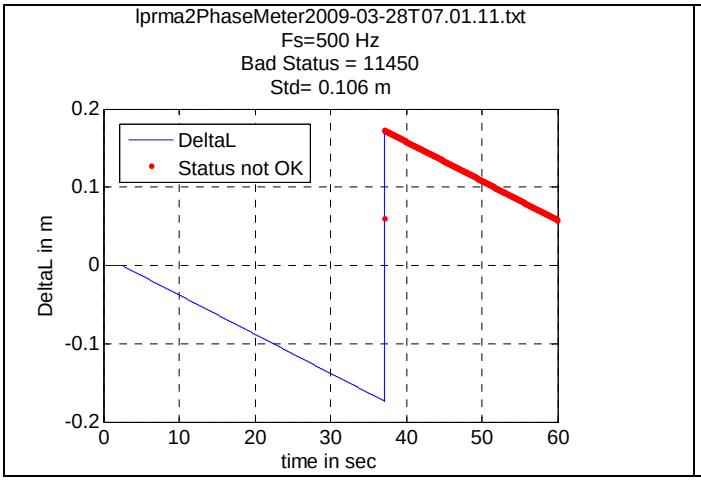


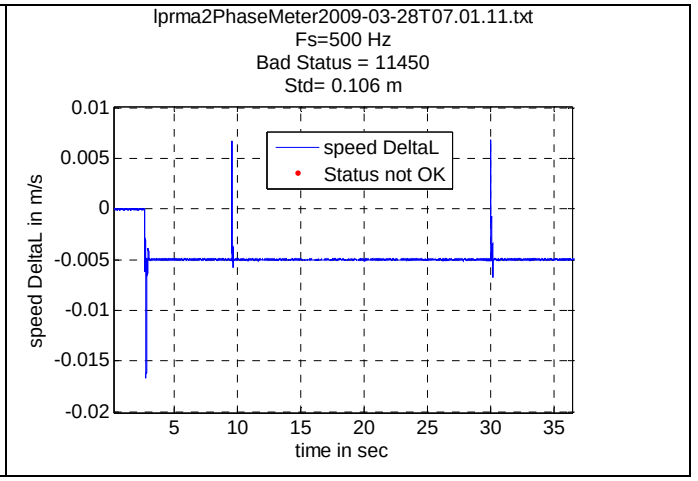
Is this the level we expect ?

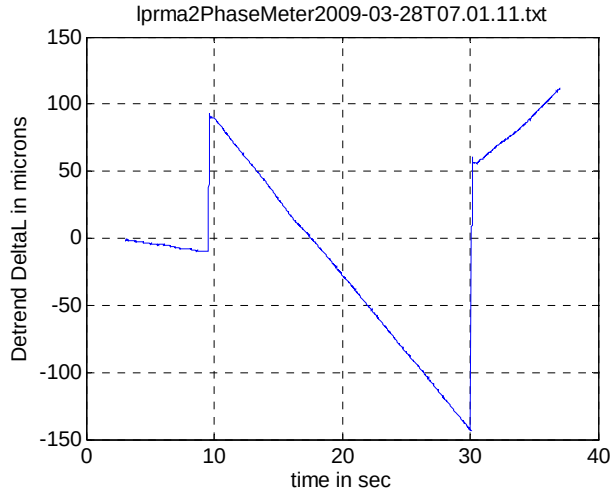
Test with DDL7 and DL4

dltestTrack dld4 14 5 (5 mm/sec from 14m)
with fringe search on top with DDL
Lprma2PhaseMeter28T07.01 and Lprma2PhaseMeter28T07.02

==> Filename: lprma2PhaseMeter2009-03-28T07.01.11.txt
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL Mean= -5.790663e-003 m
DeltaL PV= 3.457479e-001 m
DeltaL rms= 1.060003e-001 m
Status Not OK: 11450: Only due to the known overflow problem !...







beam search appears on the detrended signal

open pupil tracking loop

DDL sent to +34000 and record OPL: OK

Lprma2PhaseMeter28T07.08… EMPTY FILE…

Is this due to the bad operator or a SW “feature” ?

Open pupil tracking loop and record centroids while going from -34000 to +34000

SETAPOS-34000

StartMPO

StartENG.

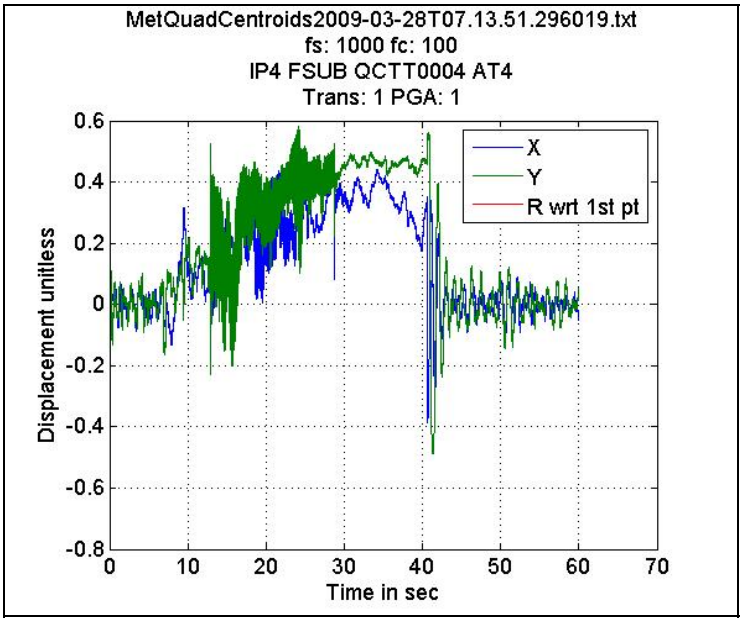
STOPMPO

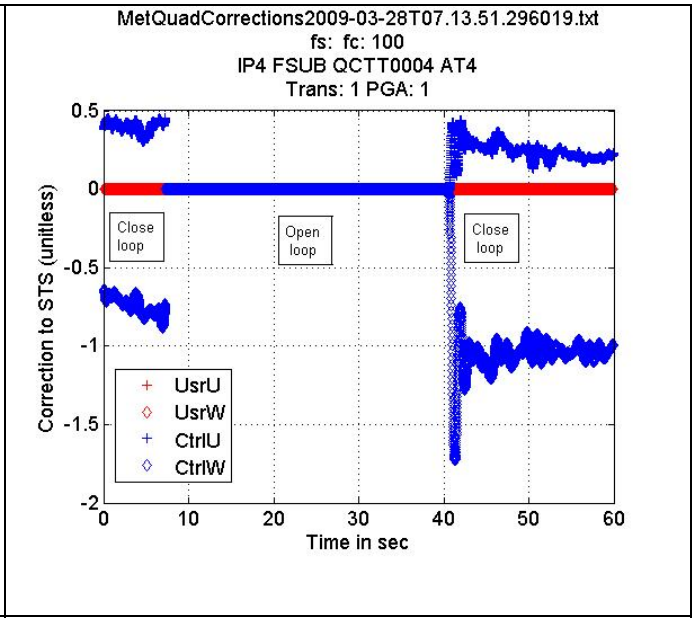
SETAPOS+34000

STARTMPO

STOPENG

Metquadcentroids28T07.13.51





The displacement of DDL7 over its full stroke introduced a lateral displacement of PRIMET IP4 of about 30% of its radius (ϕ/2=1169/2 μm/) , i.e. 175 μm (PV)
(TBC: HOW IS OPERRATED M3 during preset ?:)

Up to now the dome was closed

6.6 Open enclosure, data recorded through BC-DDL7 IP4 with fixed DL for VLTI COM

STRTMPO
does not work well initially because guiding conditions are not fulfilled
->Ask Robert to ignore residual XX seconds after StartMPO
Is that implemented now ??? which parameters ? I suggest to wait 4 seconds after STRTMPO before checking the guiding condition related to the residuals radial position error

Recentering manually from pspzgui then it works

At 5h19 , we open enclosure AT4 AT3 AT2 (AT1 remains closed)

at DL#4 OPL=14 m
STARTMPO
STARTPM

Closed loop:
Lprma2PhaseMeter28T09.31
==> Filename: lprma2PhaseMeter2009-03-28T09.31.04.txt

Sampling frequency= 2000 Hz
Number of samples= 120000
DeltaL PV= 1.086080e-005 m
DeltaL rms= 1.689301e-006 m
Status Not OK: 0

Metquadcentroids28T09.31

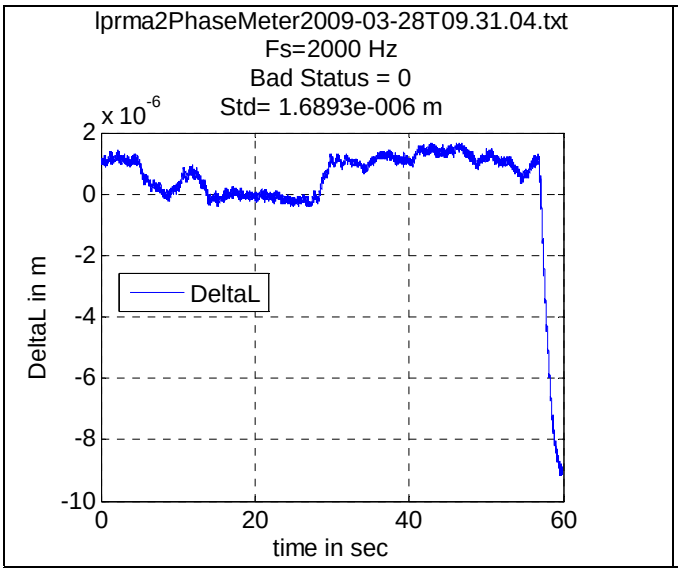
Pk= 34% rms= 4.9 %p

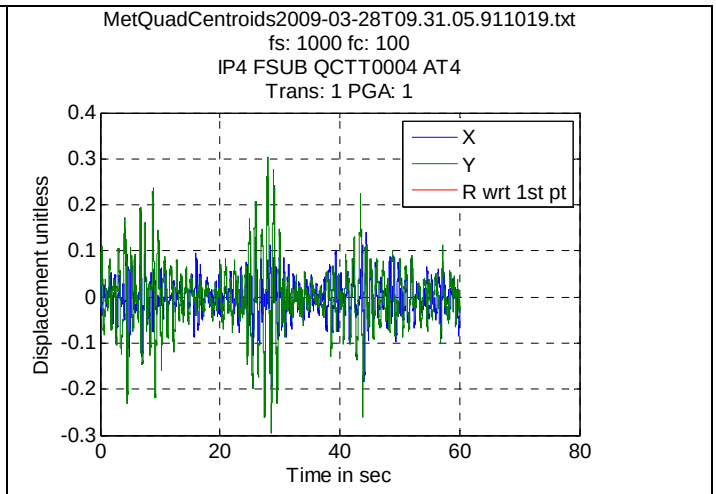
Open Loop:

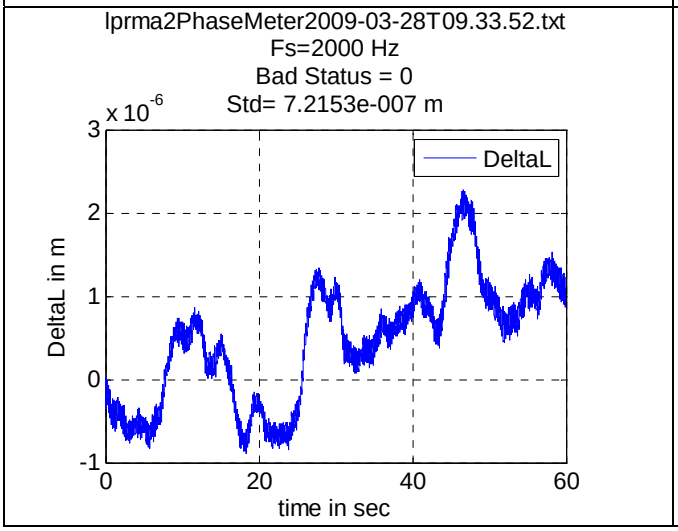
Lprma2PhaseMeter28T09.33

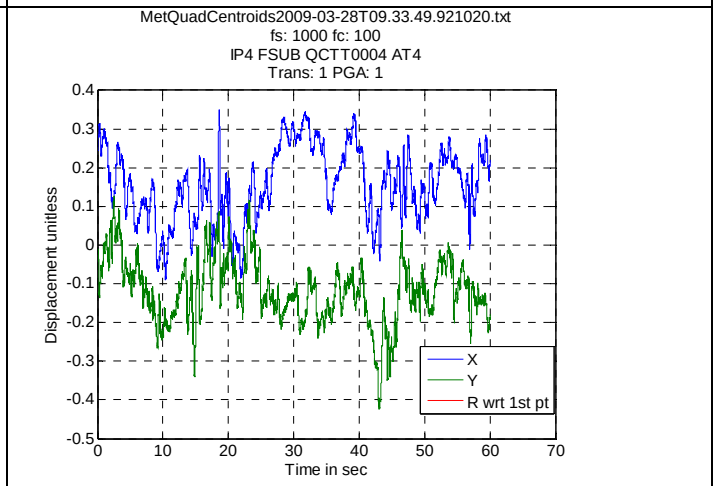
Metquadcentroids28T09.33 (open loop)

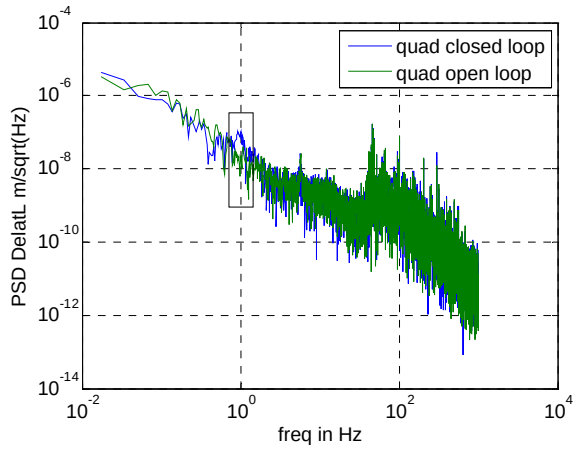
Pk= 48% rms= 8 % p



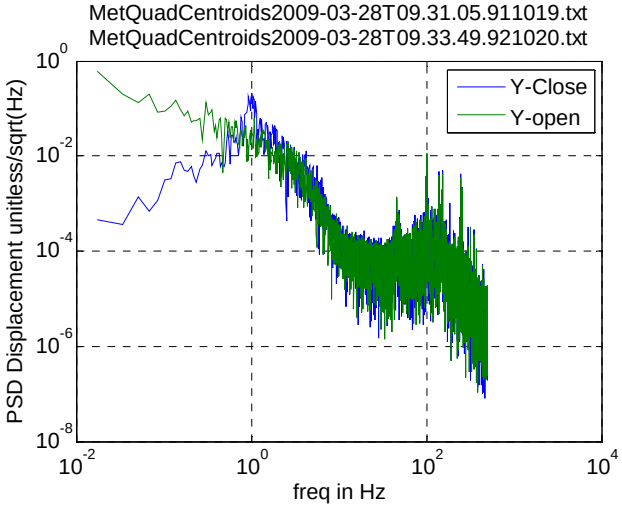








(no impact at Fcorr=100Hz)



amplification at ~ 1 Hz (waterbed)

Impact of Pupil tracking on DeltaL

Bandwidth	rmspsd DeltaL with quad open loop	rmspsd DeltaL with quad closed loop	Δ(rmspsd)
[0-1000]Hz	601nm	584nm	17nm
[0-0.5]Hz	596nm	578nm	18nm
[0-2]Hz	598nm	581nm	17nm
[0.5-2] Hz	40nm	54nm	-14nm

At OPL=40m:
ComputeVCMParametersATBC('UT4',4,4,20,0,-1)=1.58e-3
(guiding was maintained during displacement
Lprma2PhaseMeter28T09.37
Metquadcentroids28T09.37 (close loop)

Lprma2PhaseMeter28T09.40
Metquadcentroids28T09.40 (open loop)

At OPL=50m
ComputeVCMParametersATBC('UT4',4,4,25,0,-1)=1.966e-3

Lprma2PhaseMeter28T09.43
Metquadcentroids28T09.43 (close loop)

Lprma2PhaseMeter28T09.45
Metquadcentroids28T09.45 (open loop)

At OPL=90m
ComputeVCMParametersATBC('UT4',4,4,45,0,-1)=3.5e-3
Lprma2PhaseMeter28T09.49
Metquadcentroids28T09.49 (close loop)

Lprma2PhaseMeter28T09.51
Metquadcentroids28T09.49 (open loop)

At OPL=110m
Closed loop
ComputeVCMParametersATBC('UT4',4,4,55,0,-1)=4.273e-3
Lprma2PhaseMeter28T09.55
==> Filename: lprma2PhaseMeter2009-03-28T09.55.53.txt
Sampling frequency= 2000 Hz
Number of samples= 120000
DeltaL PV= 7.190800e-006 m
DeltaL rms= 1.577733e-006 m
Status Not OK: 0
Metquadcentroids28T09.55 (close loop)
Pk= 26% rms= 3.9%
Open Loop
Lprma2PhaseMeter28T09.57
==> Filename: lprma2PhaseMeter2009-03-28T09.57.39.txt
Sampling frequency= 2000 Hz
Number of samples= 120000
DeltaL PV= 4.673000e-006 m
DeltaL rms= 1.085273e-006 m
Status Not OK: 0
Metquadcentroids28T09.57 (open loop)
Pk= 38%p rms= 6.2%

The Pupil motion expressed in % of the beam radius is smaller for DL OPL=110 than 14m. However, we did not check the size of the retroreflected beam for OPL=110 ! (probably bigger)

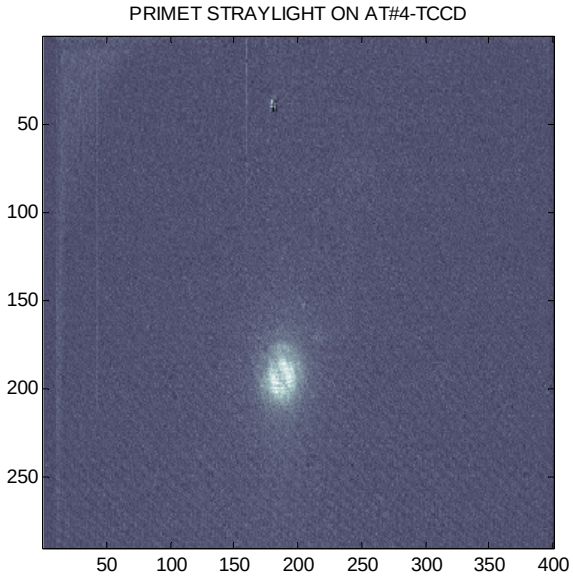
Again no glitch, but we are not in a representative situation: cyclop mode with fat spot from IP2 which improves artificially the beam overlap.

6.7 Check level of PRIMET straylight on TCCD

On wat4tcs
Start TCCD and save files:

Estimation straylight PRIMEt watcs
cd /data/ATCS/INS_ROOT/SYSTEM/DETDATA
Background removed
dataoff=fitsread('PRIMET_off_2.fits');
dataon=fitsread('PRIMET_on_2.fits');

imagesc(dataon-dataoff)
exposure time missing: cannot determine equivalent magnitude….



7 SATURDAY 28/3: FIRST PRIMETB OBSERVATION WITH 2XAT'S AND 2X DDL WITH PUPIL TRACKING

7.1 Check alignment of Marcel on the Sighting scope

we observe that IP3 and IP2 are shifted as seen through the sighting scopes located on the alignment plates of the MIDI feeding optics.
The shifts observed for IP3 and IP2 on the scope corresponds to the inner beams of Marcel.
Beams C(IP5) and E (IP2) have moved in the same direction (they share the same Marcel's output)
The marcel corner cubes are centered with respect to the sighting scopes for all IP's

7.2 Preparation for PRIMET observation on 2 AT-STS through the DDL

AT#3 is now finally operational on G2 and can be used by PRIMET.

Although Marcel is not aligned on "VLTI", and that consequently the FSU-ACU will not be aligned on the "VLTI"after an FSU-BTK, we attempt the operation of PRIMET on 2 AT's.

Beam search on AT#4 OK:

➔ STARTMPO successful !!

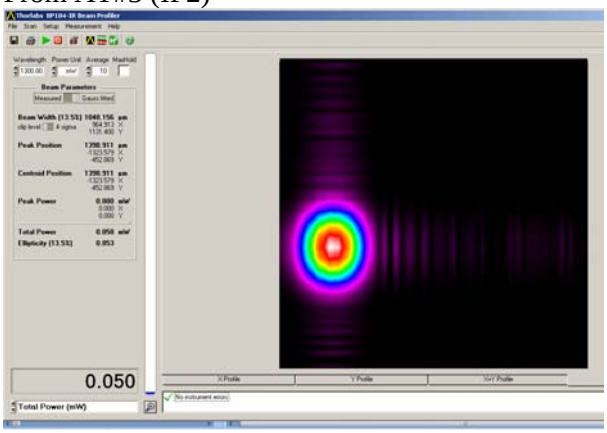
Beam search on AT#3 OK !!!!!

➔ We go in the lab to check to quality of AT3 beam

At
Fsm 12, 12
VCM 21.9 24.3 (0.9; 2.5 alignment offset + 2 2.8 guide offset)
(fixed curvature)
Pressure DL =0.8 bar at OPL= 30m
We have put the DL further away because at 14m, the DL-VCM could not re-image properly the pupil (pressure too low)

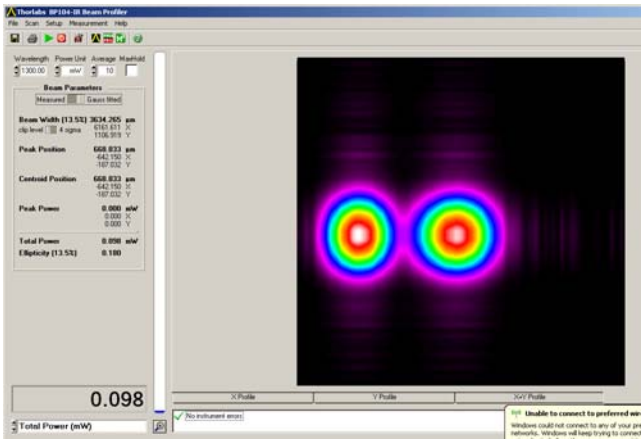
We observe the beam profiles

From AT#3 (IP2)



ϕ=1048 μm (13.5 %)
P=0.050 mW
ε=0.85

From AT#3 and AT#4



by subtraction, the power contribution of IP4 should be 0.098-0.050=0.048mW
the beam size and ellipticity of IP4 are comparable to IP3

On beam profiler in front of IP2
IP2: Centroid:-1226 -226
IP4: Centroid: -123 26

The beams are shifted by almost 1 mm on the BP located in front of quadIp2, although they should be ~ centered on the FSU-BC because the spots are nice (so they don't vignet)

➔ The beams are tilted !! estimated tilt ~ 1mm/at 70cm 1.4 mrad !

We check again the tilt on the injection block

Beam Profiler 10cm away from Injection block
P: 19; 590
S: 107; 244
ΔR=357

Beam Profiler XX cm away from Injection block
P -475;846
S -456; -117
ΔR=963

➔ The tilt at the output of the injection block is 750microrad=0.75 mrad =150 arcsec !

Explanation :
we have re-aligned on Thursd.26/3, the PRIMET beams on the DL ghost as seen on the AT4 TCCD.
In that case, the angular error most probably includes the wedge of the central patch of FSU Beam combiner

So we re-align the metrology beams again using the following procedure
Procedure:

1. Pupil track on IP4
2. Observe both beams IP2 and IP4 on the beam profiler
3. Tilt the S polarization (IP2) to superimpose Ip2 on Ip4
4. Slightly Align the quadcell of IP4

(we should have checked if the beams were centered on the alignment plates at the entrance of the tunnel, to verify if the new switchyard encoder position "BC-DDL" defined in sections 6.2.2 and 6.5 are still appropriate…)

Parameters of the pupil tracking loop
We lowered the gain from 0.015 (used the days before) to 0.01

IP2-AT#3	IP4-AT#4
Gain:-0.01 A1 -1.89038518941956 B1 -1.99905795915703 A2 0.89215003191845 B2 -99905795915702 IM **1 0 0 -1**	Gain -0.01 A1 -1.89038518941956 B1 -1.99905795915703 A2 0.89215003191845 B2 -99905795915702 IM **1 0 0 1**

7.3 Data files on AT4 and AT3 through moving DL and DDL

BTK
TTP 1 (IP2) X=-286e-6 Y=254e-6
TTP 2 (IP2) X=-188e-6 Y=-777.6e-6 rad meca

Configuration AT#4 on Ip4	
AT#4-STS	J2-Beam B
FSMB	12.9 ; 12.7
VCMB	21.6; 23.6 (off 2.6 4.6) C= 4.7 e-3mm-1 (1.93 bar)
DL#4	OPL=14m VCM ComputeVCMParametersATBC('UT4',4,4,7,0,-1)**= 5.820640e-004 mm-1 (i.e No offset)**
M16	DL#4-4AT (to feed Beam B in ip4)
Switchyard	SW4->BC-DDL or encoder value 221818
DDL	DDL7 at OPL=??
Ip	Ip4
Primet Pol	P Quadcell 4

Configuration AT#3 on IP2	
AT#3-STS	G2-Beam B
FSMB	12,12
VCMB	21.8 23.8 C= FIXED CURVATURE (Value ??) (theoretical value C=-1.367396e-3 or ROC=-731mm)
DL#2	OPL=30m VCM 0.002032 (0.8 bars) instead of ComputeVCMParametersATBC('UT2',2,2,15,0,-1)= 8.88e-004 mm-1
M16	DL#2-2AT (to feed Beam B in ip2)
Switchyard	SW2->BC-DDL or 230365
DDL	DDL8 at OPL=??
Ip	Ip2
Primet Pol	S Quadcell 3

Frequency Stabilization closed

Enclosure **OPEN**:

Fringe search on DDL7 (IP4)

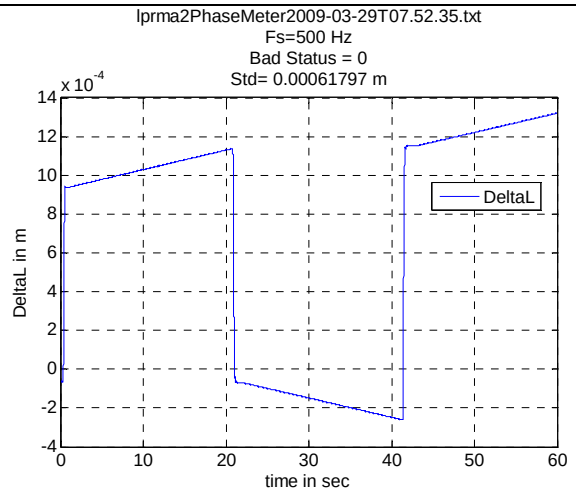
No tacReport unfortunately

==> Filename: lprma2PhaseMeter2009-03-29T07.52.35.txt

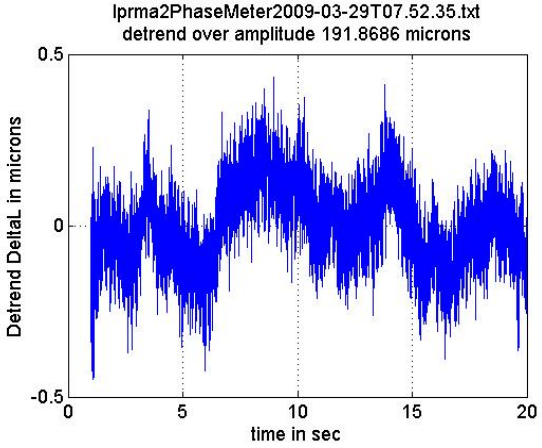
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL Mean= 6.784947e-004 m
DeltaL PV= 1.580760e-003 m
DeltaL rms= 6.179746e-004 m
Status Not OK: 0

Metquadcentroids29T07.52 (closed loop)

IP4: Pk= 29 % rms= 3.6 %
IP2 : Pk= 22% rms= 1.2 %



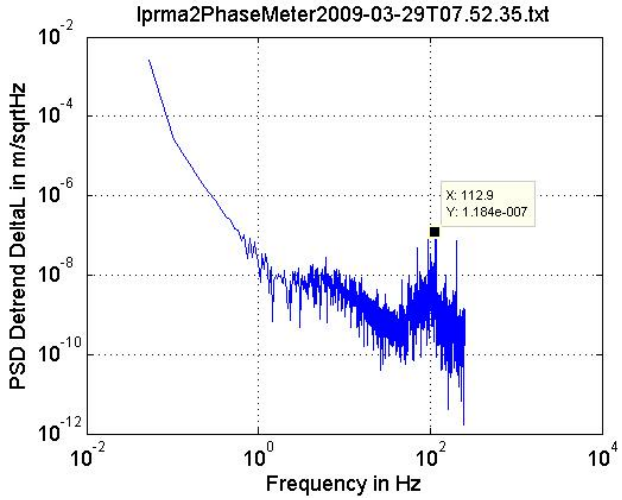
Speed fringe search: $\Delta OPL/\Delta t$=10 microns/sec

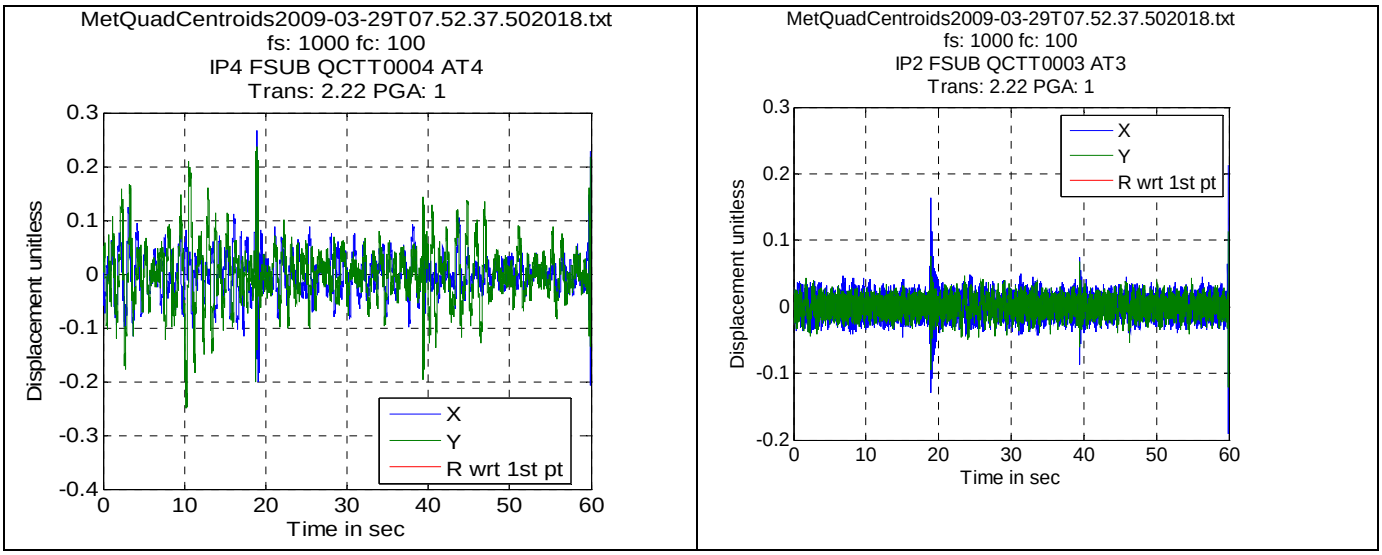


OPL error over a fringe search of 192 microns from t=1 to 20 sec: PV=880nm

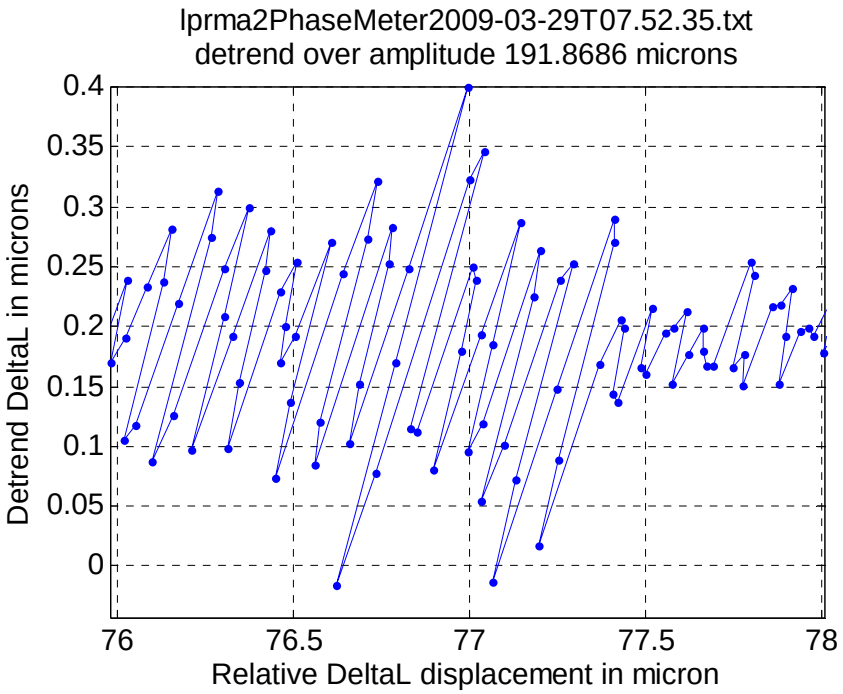
high frequency OPL error dominated by PV~250nm at 112 Hz

same conclusion for the next fringe search window t=22 to 41 sec





seems that we see effect of fringe search on both IPs ???!
Effect of ghost ?
Significantly worst perfo on IP4 (amplification at~ 1Hz)



periodical error of 200to 400nm every 100nm OPL

SETAPOS DDL7 from -34000 to 34000

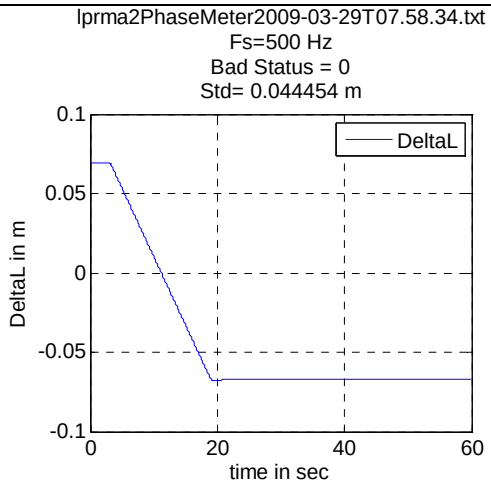
==> Filename: lprma2PhaseMeter2009-03-29T07.58.34.txt

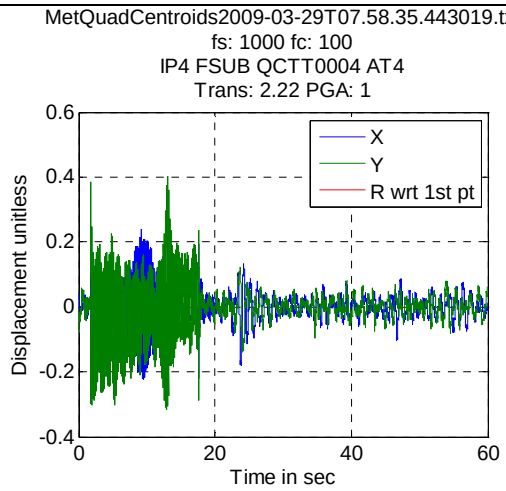
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL PV= 1.365978e-001 m
DeltaL rms= 4.445432e-002 m
Status Not OK: 0

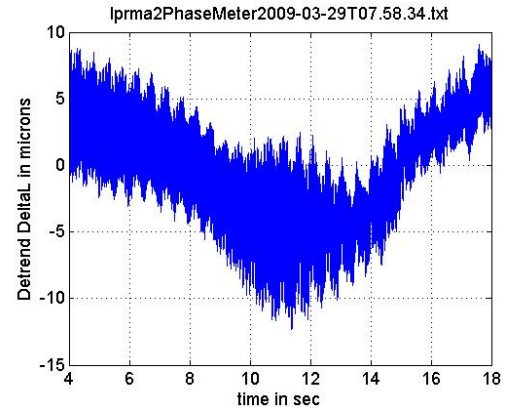
Metquadcentroids29T07.58 (closed loop)

IP4: Pk= 47 % rms= 4.6 %
IP2: Pk= 30% rms=3.7 %

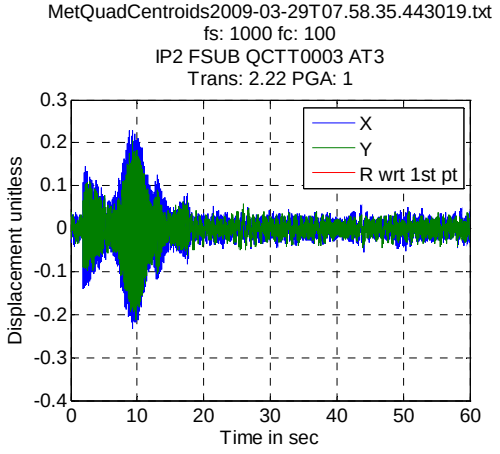
tacReport.29T07.58: problem with file format when importing into matlab







Again large OPL error at 101.9 Hz (see section 6.5)

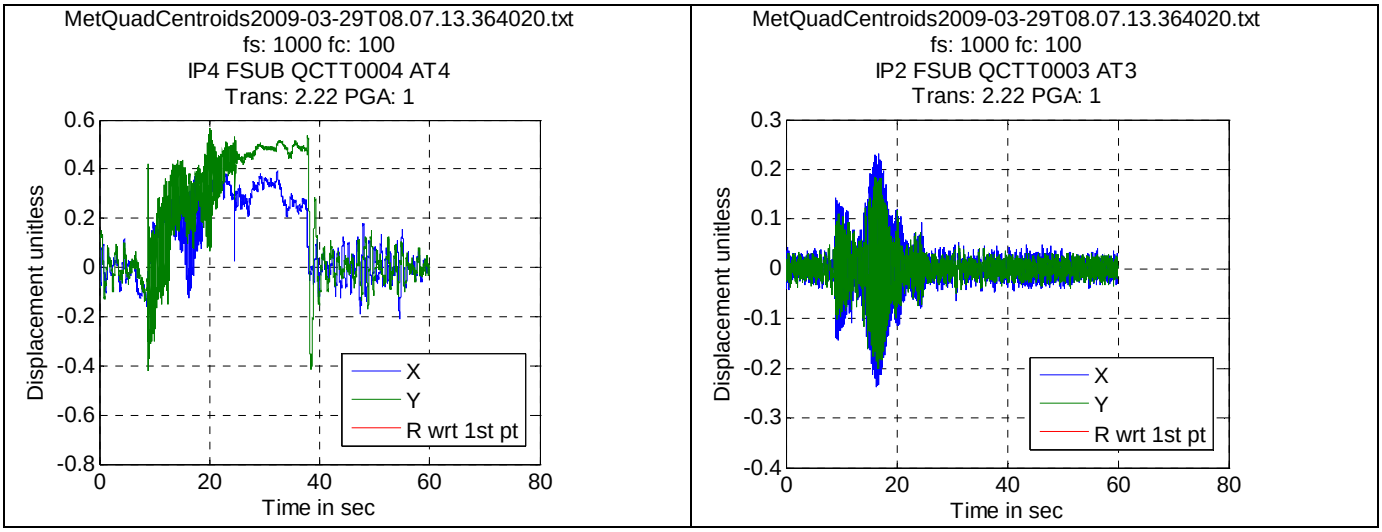


X=Y and ~ in phase displacement at 45 deg

SETAPOS DDL from -34000 to 34000

Metquadcentroids29T08.07 (open loop)

STARTMPO
STARTENG
STOPMPO
SETAPOS
STARTMPO

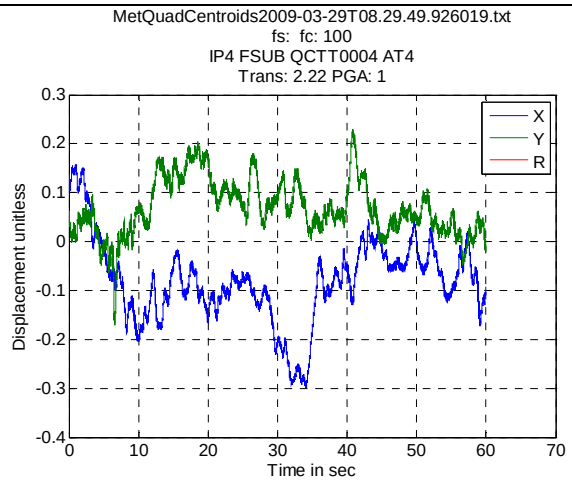


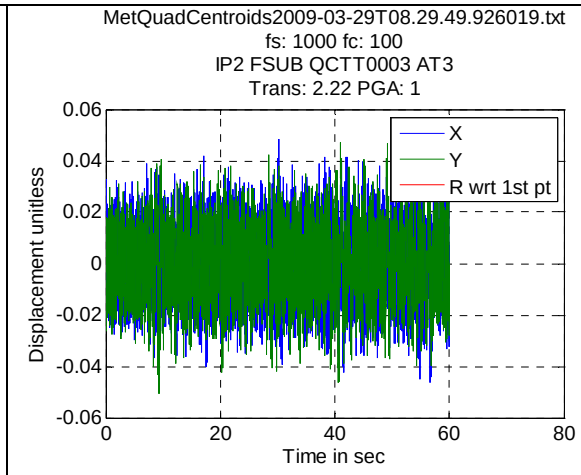
The displacement of DDL7 over its full stroke introduced a lateral displacement of PRIMET IP4 of about 50% of its radius (ϕ/2=1048/2 μm/) , i.e. 262 μm (PV)
(see section 6.5 for comparison: 175 μm PV)
(TBC: HOW IS OPERRATED M3 during preset ?:)
Again "Leakage on IP2 ?....)

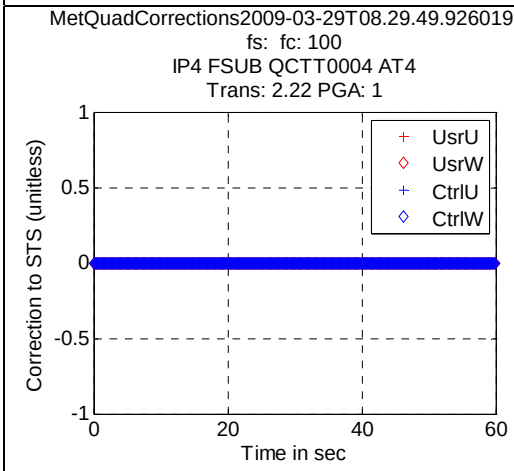
DL#4 moves at 5mm/sec from 14mm and startfringe search on DDL7
Lprma2PhaseMeter29T08.25------- > EMPTY FILE !!!!!!!!
(meanwhile pupil tracking is OK)

DL#4 (Ip4) MOVES AT 10MM/SEC FROM 15m
while on IP2: pupil tracking with no DL/DDL motion

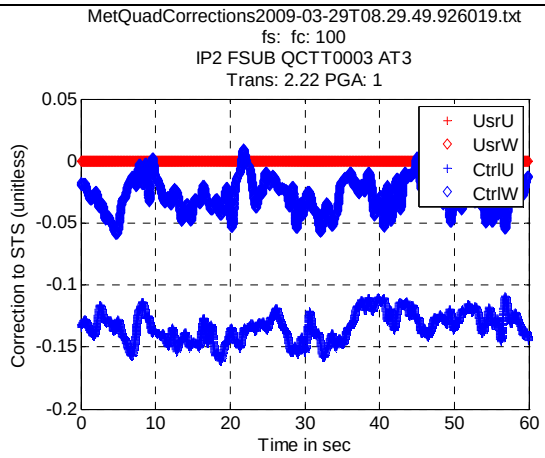
Metquadcentroids29T08.29 (open loop on Ip4, closed loop on Ip2)
IP4: Pk= 43 % rms= 8.2 %
IP2: Pk= 6 % rms= 0.9 % !!!! excellent perfo…







Open loop on Ip4



corrections are small on IP2

7.4 Test PRIMET Beam Tracking

DL#4 14m
DL#2 at 30m

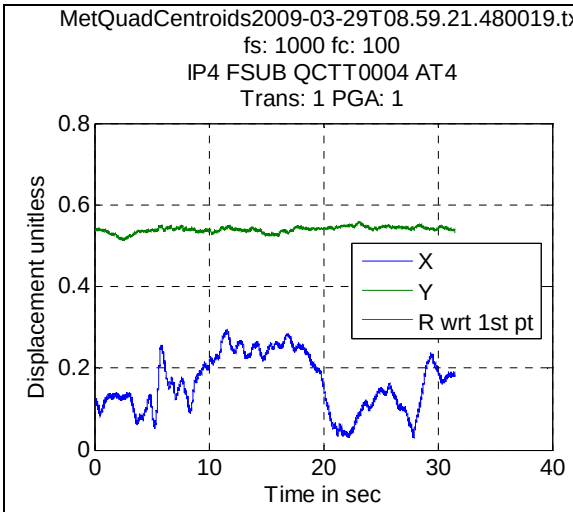
BTK: Amplitude:0.15
Freq 10 Hz
Filtertau 1

➔ as noticed earlier the modulation is corrupted and does not follow a circle. Demod has no meaning. Data cannot be correctly analysed.

AT4 VCM 21.6; 23.6

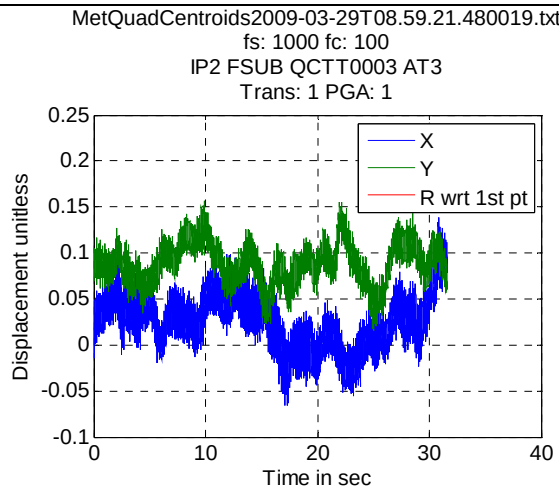
We observe 120 Hz on AT#3 path
Metquadcentroids29T08.59 (open loop)

(AT#4 vcm does not respond and we need to reboot)



open loop

Beam completely offseted in Y after reboot of AT#4-VCM (IP4)



Open loop

try anyway BTK on AT#3-Ip2

Step 0.05 (alignment offset on AT#3 VCM) look at ip2 demodx and demody

First serie horizontal negative-> return to center (rapidely)

Second vertically up and down-> returned slow

Metquadcentroids29T09.01

BTK data useless but I checked if the BTK modulation leaks on quad_IP4 due to a ghost from IP2 on quad-IP4 No modulation leakage detected. However, the beam on quad- Ip4 is largely decentered (after VCM reboot) which may hide the phenomenon.

8 SUNDAY 29/3

8.1 Comparison of BTK on MARCEL between FSUA and FSUB

FSUB

yesterday we had
TTP 1 (IP2) X=-286e-6 Y=254e-6
TTP 2 (IP4) X=-188e-6 Y=-777.6e-6 rad meca

BTK on SUM only beam 1 TTP1: X=-289.5 Y 257 Sum 14000 A 5700 B 6000 C 1300 D 850 (enable BTK on B only: 6900 in the same conditions)	BTK on SUM only beam 2 TTP2: X=27.3 Y=-563 Sum 17400 A 2100 B 2000 C 7000 D 6000

After another BTK we find again, the value of yesterday for TTP2

➔ Reproducibility is not good: do we center on ghost?

FSU A

set beam2 off
center ACU beam 1to 0,0
start spiral search on beam1

BTK on SUM only beam 1 TTP1: X=-63 Y -48 Sum 35000 A 4050 B 12400 C 11350 D 7500	BTK on SUM only beam 2 TTP2: X= -442 Y=780 Sum 26800 A 3250 B 7000 C 7300 D 9100

CONCLUSION

Significantly more flux on FSUA than on FSUB (factor 2 to 3)
Reproducibility of BTK on FSUB-TTP2 is not good.

8.2 Preparation for PRIMET observation on 2 AT's

set same parameters as yesterday.
Initially no flux, but a cover had been left on G2 !

Track on AT#3- Ip2

IP2
Gain:-0.01
A1 -1.89038518941956
B1 -1.99905795915703
A2 0.89215003191845
B2 -99905795915702
IM 1 0 0 -1 (same as yesterday)

VCM AT#3: 21.58 23.49

pb STS-VCM AT#4

Beam going to entrance of J2-B light duct is OK and centered
Straylight can be seen on TCCD, but no flux is coming back from AT#4.
Test also performed with red laser diode connected to the PRIMET fiber: same conclusion

8.3 Cyclop Mode

8.3.1 Configuration

IP4=Retro FSU B

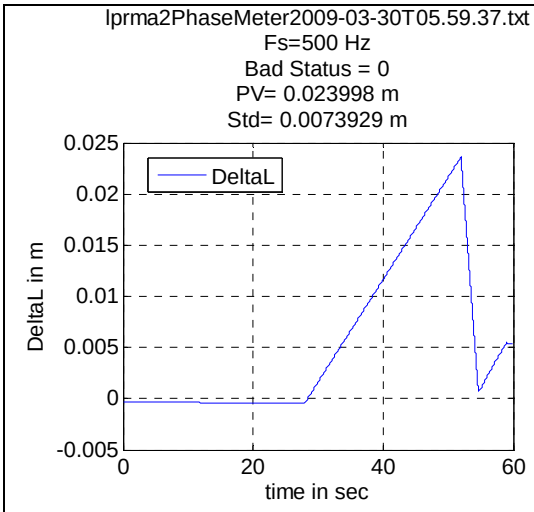
Configuration AT#3 on IP2	
AT#3-STS	G2-Beam B
FSMB	12,12
VCMB	21.58 23.49 C= FIXED CURVATURE (which one?) (theoretical value com1 :C= -4.743185e-003 mm-1)
DL#2	OPL=30m VCM 0.002032 (0.8 bars) ComputeVCMParametersATBC('UT2',2,2,15,0,-1)= 8.88e-4e-004 mm-1
M16	DL#2-2AT (to feed Beam B in ip2)
Switchyard	SW2->BC-DDL or 230365
DDL	DDL8 at OPL=??
Ip	Ip2
Primet Pol	S Quadcell 3

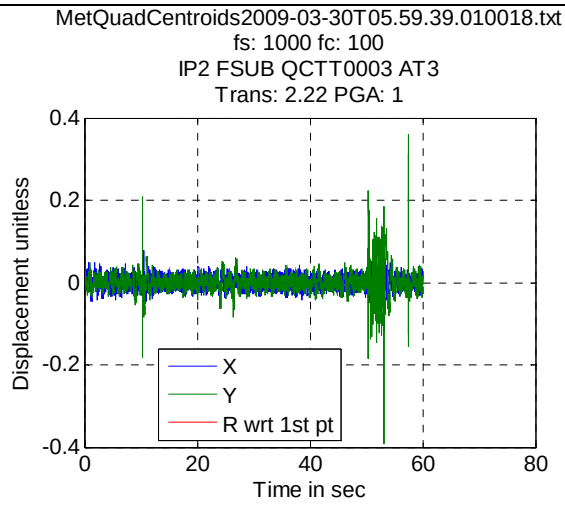
8.3.2 Check DDL Motion

ramp_500_Hard on DDL8 (25 mm OPL)
(representative of specs for fringe scanning speed)

200000 points at 500micron/sec (mechanical)
DDL applies 25 sec at 8hHz-> stroke of ~12.5 mm (mechanical)

==> *Filename: lprma2PhaseMeter2009-03-30T05.59.37.txt*
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL PV= 2.399771e-002 m
DeltaL rms= 7.392867e-003 m
Status Not OK: 0 (cyclop mode=optimistic case)
*Metquadcentroids30T05.59 (**closed loop**)*
IP2: Pk= 41% rms= 2% (over whole time window : dominated by transcients)
Pk= 10% rms= 1.3% (during fringe search from t=15 to 50 seconds)





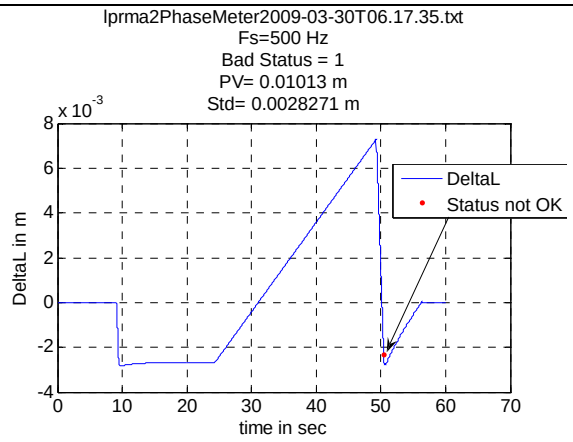
speed during ramp δOPL/δt=1mm/sec

ramp_200ums.txt on DDL8 (10mm OPL)
(representative of specs for blind tracking speed)

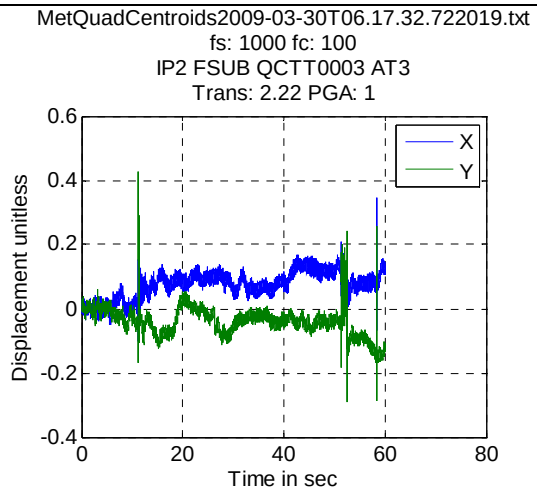
200000 points at 200micron/sec; DDL applies 25 sec at 8hHz-> stroke of ~5 mm
25 sec of recording. Initially the DDL is not at zero, but the file request to start at 0

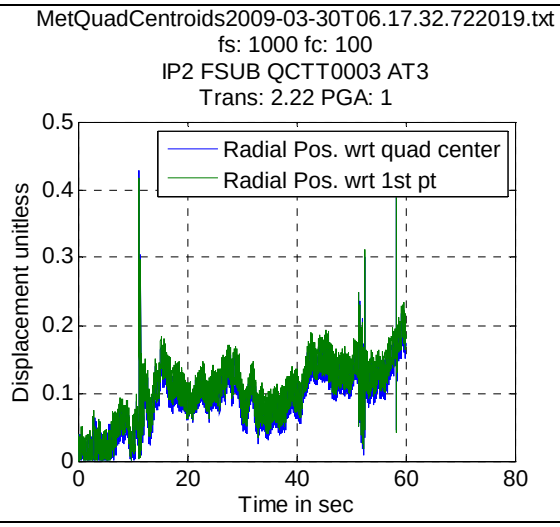
==> Filename: lprma2PhaseMeter2009-03-30T06.17.35.txt
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL PV= 1.013044e-002 m
DeltaL rms= 2.827072e-003 m
Status Not OK: 1 (only 200kHz not detected…); nothing related to probe or ref signal…
*Metquadcentroids30T06.17 (**closed loop only first seconds then open loop**)*

IP2 Pk= 43 % p rms= 4.5 % (dominated by transient)
Although the DDL comes back to its initial zero position at the end of the recording, the radial position does not:
Shift of ~15%:
non repeatability of DDL or drift along the VLTI path ?



speed during ramp δOPL/δt=400µm/sec
status: 1x 200kHz non detected.





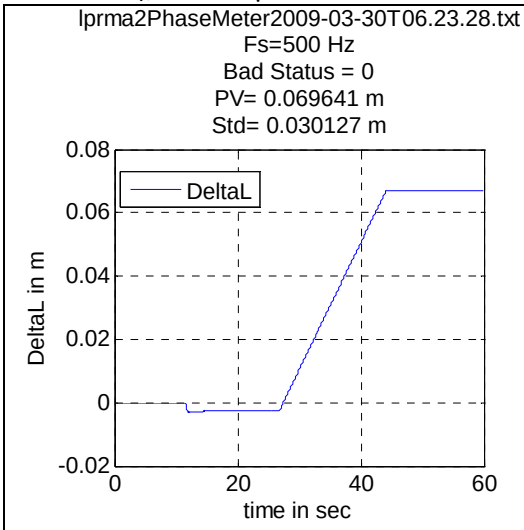
ramp_2000ums.txt on DDL8 (100 mm OPL)
200000 points at 2000micron/sec (25sec at 8kHz): theory:50 mm stroke

==> Filename: lprma2PhaseMeter2009-03-30T06.23.28.txt

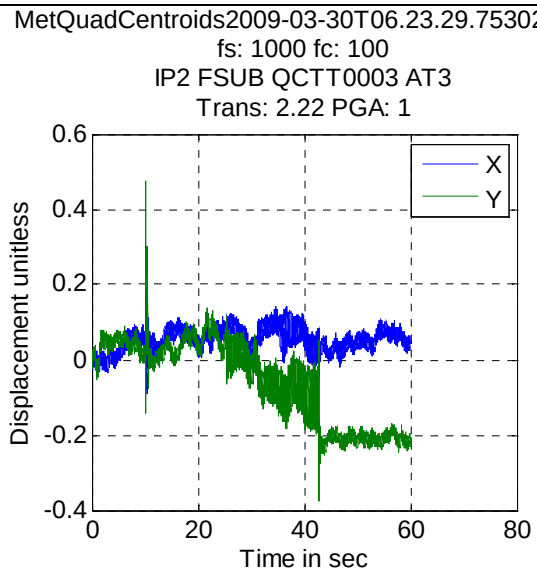
Sampling frequency= 500 Hz
Number of samples= 30000
DeltaL PV= 6.964094e-002 m
DeltaL rms= 3.012666e-002 m
Status Not OK: 0

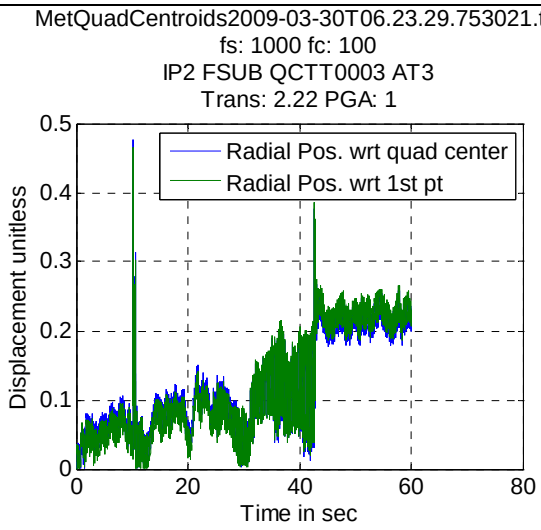
Metquadcentroids30T06.23 ***(closed loop only first seconds then open loop)***
IP2 Pk= 46 % p rms= 7.5 % (dominated by transient)

The beam displacement after OPL=69 mm is about 20% of the beam radius ($\phi/2$=1048/2 μm according to section7.2), i.e. 105 μm.



speed during ramp δOPL/δt=4mm/sec
why do we get only PV=69 mm ? (should get 100mm)





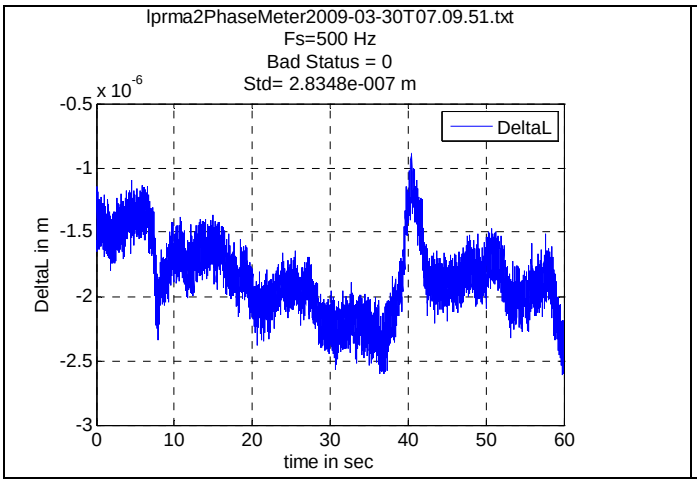
8.3.3 Fixed DL/ DDL

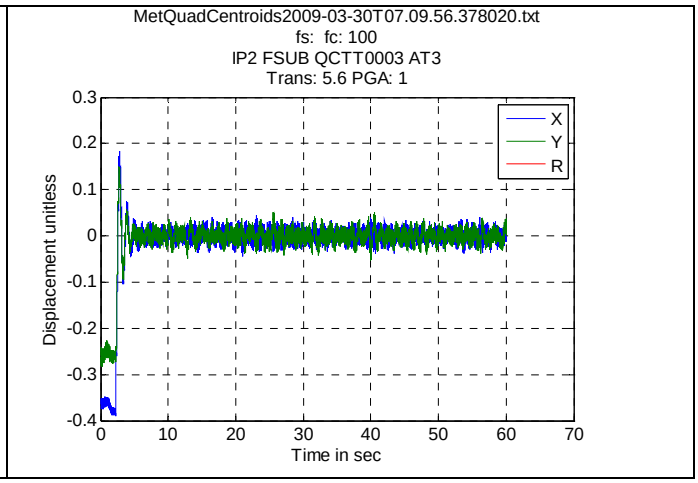
last file with DL at OPL=30m
==> Filename: lprma2PhaseMeter2009-03-30T07.09.51.txt
Sampling frequency= 500 Hz
Number of samples= 30000

DeltaL PV= 1.718600e-006 m
DeltaL rms= 2.834829e-007 m
Status Not OK: 0 (cyclop mode)

Metquadcentroids30T07.09 (closed loop)

IP2: PV=8.2 % rms=0.9 % (after closing the loop)





9 MONDAY 30/3: PREPARE PRIMET FOR FSU CALIBRATION

Preparation of PRIMET for the calibration of FSUB calibration for night observations

BTK FSUB
TTP 1 (IP 2) X=-.269e-4 Y=9.672 e-5
TTP 2 (IP4) X=-1.73e-4 Y=-7 693 e-4

Move IFOB IP2 to get better metrology signal:then
BTK FSUB
TTP 1 (IP 2) X=-2.295e-4 Y=2.869 e-4
TTP 2 (IP4) X=-1.73e-4 Y=-7 693 e-4

TTP1 (TTP2 off)	TTP2 (TTP1 off)	both beams:
SUM=19700	SUM=24000	SUM=44600
A=8200	A=4700	A=11400
B=8200	B=4400	B=12800
C=2100	C=8200	C=11400
D=1450	D=7200	D=9100

10 HISTORY OF THE INTERACTION MATRIX OF THE PUPIL TRACKING

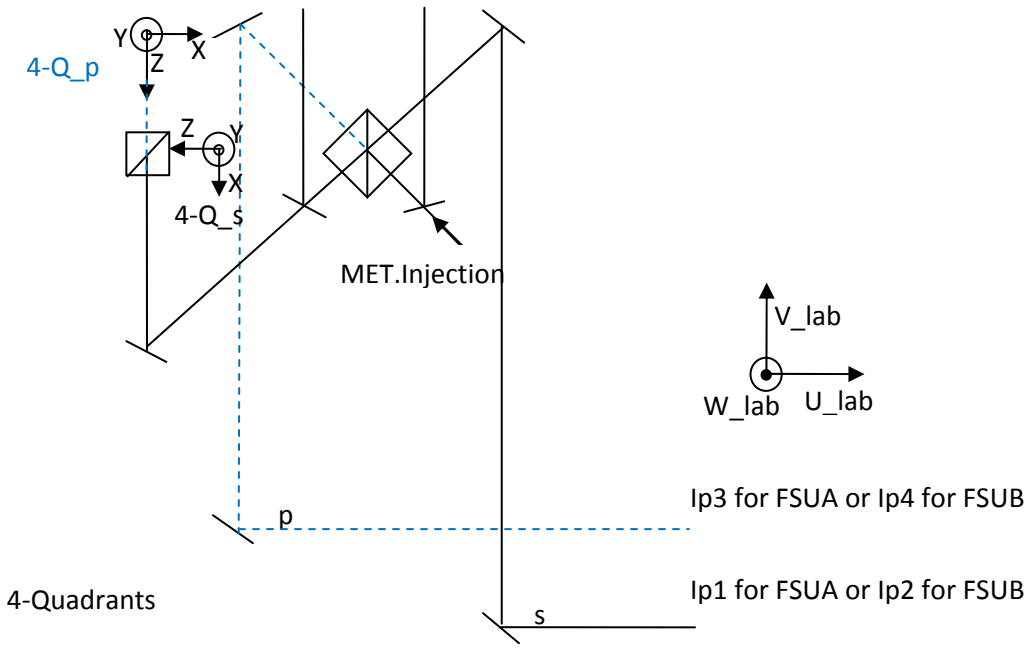
Date		Configuration	IM	loop Parameters
wed 25/3	A	AT#4-J2(south)-Beam B DL#4-Ip4-BC quad-IP4 (P beam)	1 0 0-1	Gain= -0.015 A1=-1.8904 B1=-1.999 A2=0.8921 B2=0.999 Very good perfo
Thurs 26/3	A	AT#4-J2(south)-Beam B DL#4-Ip4-BC quad-IP4 (P beam)	*1 0 0 0*	*can only track on X…* *(beam vignetting ? guiding residuals too large ?)*
	B	AT#4-J2(south)-Beam B DL#4-Ip2-BC quad-IP2 (S beam)	-1 0 0 -1	Gain= -0.015 (other parameters supposed to be the same). large residuals
Fri 27/3	B	AT#4-J2(south)-Beam B DL#4-Ip2-BC quad-IP2 (S beam)	-1 0 0 -1	Gain= -0.015 (other parameters supposed to be the same). large residuals
	C	AT#4-J2(south)-Beam B DL#4-Ip2-BC/DDL8 quad-IP2 (S beam)	-1 0 0 1	large residuals
	A	AT#4-J2(south)-Beam B DL#4-Ip4-BC quad-IP4 (P beam)	*1 0 0 0*	*can only track on X…* *(beam vignetting ? guiding residuals too large ?)*
	D	AT#4-J2(south)-Beam B DL#4-Ip4-BC/DDL7 quad-IP4 (P beam)	1 0 0 1 (as during Com3)	Gain=-0.015 large residuals
Sat 28/3	D	AT#4-J2(south)-Beam B DL#4-Ip4-BC/DDL7 quad-IP4 (P beam)	1 0 0 1	Gain -0.01 A1 -1.89038518941956 B1 -1.99905795915703 A2 0.89215003191845 B2 -99905795915702: (B2 0.99905795915702 ??) large residuals
	E	AT#3-G2(North)-Beam B DL#2-Ip2-BC/DDL8 quad-IP2 (S beam)	1 0 0 -1	Gain:-0.01 A1 -1.89038518941956 B1 -1.99905795915703 A2 0.89215003191845 B2 -99905795915702 smaller residuals than Ip4 (smaller light duct?)
Sun 29/3	E	AT#3-G2(North)-Beam B DL#2-Ip2-BC/DDL8 quad-IP2 (S beam)	1 0 0 -1	Gain:-0.01 A1 -1.89038518941956 B1 -1.99905795915703 A2 0.89215003191845 B2 -99905795915702

3 parameters affects the sign of the interaction matrix between the Quadcell and the STS-VCM

- BC-DDL or BC (config A to D or B to C): This changes the sign of the IM along the Y direction
- AT Station (North-South) (config C to E): This changes the sign of the IM both along X and Y
- IP sent to STS beam B (Ip2 or Ip4 observed on associated quadcell) (config A to B): This changes the sign of the IM along the X direction

During COM4: the AT-STS-VCM software did NOT apply the change of sign if the station is North or South (was it also the case during COM3?)

PRIMET B:



on IP4:

+δV_lab leads to +δX_quadP

–δX_quadS (if leakage only)

on IP2:

+δV_lab leads to +δX_quadS

-δX_quadP (if leakage only)

11 SUMMARY AND CONCLUSION ABOUT THE MIS-ALIGNMENT OF MARCEL

The situation the Marcel centroids on IRIS is described below.All centroids values given below are taken from the daily calibration: IRIS filter H and IFOA1 and IFA2 in dichroic position.

Before we started COM activities:
wed 25/3 logged on AUTREP at 9h00:
Q1beam B IP3=64.04 65.53…
Q2 beam A IP1=67.93 67.16
Q3 beam F IP4=63.27 63.21
Q4 beam E IP2=64.49 63.78

after COM4 (31/3/09) we have:
Q1 beam B IP3=65.46 64.49
- It has moved by about 1.5 pixels compared to 25/3
- Shifted by 3 PSF (vertical) as seen on the sighting scope located on the ref plate of the Midi feeding optics table.

Q2 beam A IP1=67.90 67.22
- Shifted on IRIS by about 3 pixels, but did not move compared to 25/3
- Aligned on the sighting scope located on the ref plate of the Midi feeding optics table

Q3 beam F IP4=63.06 63.31
- OK on IRIS as before COM4
- Aligned on the sighting scope located on the ref plate of the Midi feeding optics table

Q4 beam E IP2=65.71 59.85
- Shifted on IRIS---> This happenened during COM4 , thursday 26/3 afternoon
- shifted by 5 PSF(vertical) and 1 PSF (horizontal) as seen on the sighting scope located on the ref plate of the Midi feeding optics table.

Remarks and conclusion
1/ The intervention on Marcel to test the new retro-reflector (wed 25/3) did not affect the position of Marcel on IRIS. The centroids of Marcel on IRIS are the same on wed 25/3 and thur 26/3

2/ The Observations on the sighting scopes were done on 28/3.
- The shifts observed for IP3 and IP2 on the scope corresponds to the inner beams of Marcel.
- beams C(IP5) and E (IP2) have moved in the same direction (they share the same Marcel's output)
- the marcel corner cubes are centered with respect to the sighting scopes for all IP's

3/ All centroids must be compared in the same configuration. The centroids of IRIS logged in AUTREP are computed IRIS filter H and IFOA1 and IFOA2 in dichroic position. The difference of the IFOA position (Mirror/dichroic) is significant for IP3 (5 pixels) and not significant for IP1

4/ In order to calibrate FSUB with the metrology (in preparation of the night test), we tilted IFOB(IP2) Mon.30/3 afternoon from Q4 beam E IP2= 66.22 59.68 to Q4 beam E IP2 to 64.4 64.11, but BTK on 64,64 did not allow to get metrology beam, so later we moved IFOB-IP2 much further away to check if we could get metrology. This will appear in the log of 31/3. Q4 beam E IP2 was put back to 66.37 59.95 on 1st April (12h30 LT) by moving IFOB

5/ The log of the marcel centroids on IRIS of Sun.29/3 indicates crasy
values. It is because the marcel fiber had not been properly reconnected after the alignment test with the sighting scopes. After connecting again the fiber , the measured centroids were as before the alignment test with the sighting scopes. In “normal” condition, we checked that the repeatability of the Marcel K-fiber is better than 1 pixel on IRIS.

6/ we conclude that the roof mirror of Marcel, which is common to IP2 and IP3 has been tilted for an unknown reason on Thursday 28/3 afternoon.

12 CONCLUSION OF COM4 AND PERSPECTIVE FOR THE NEXT PRIMET COMMISIONING (COM6)

During COM4 (24/31-3/2009), five and a half nights were dedicated to the commissioning of PRIMET B (IP2-IP4). Due to the initial non availability of AT#3 and later on due to some hardware failure, most of the tests (5 nights) were conducted in *"cyclop mode"*.
In this configuration, one PRIMET beam is retro-reflected by an AT-STS, the other beam is retro-reflected by one of the corner cube located in front of FSUB. This increases artificially the robustness of PRIMET compared to the operation scenario of PRIMA, because the overlap of the retro-reflected beams is essentially guaranteed.

PRIMETB was successfully operated as in its future operational conditions (2xAT's and 2xDDL) during the remaining ½ night.

Date	**Time allocation**	**Hardware**	**Main Activity**
Tue 24/3/09	1 night	AT#4	PRIMET B on Marcel
Wed 25/3/09	1 night	AT#4	Cyclop mode AT#4-B-J2-DL4-IP4
Thu 26/3/09	1 night	AT#4- Quad-IP4 dead	Cyclop mode AT#4-B-J2-DL4-IP2
Fri 27/3/09	1 night	AT#4	Cyclop mode AT#4-B-J2-DL4-DDL8-IP2
Sat 28/3/09	½ night	AT#4 & AT#3	PRIMET B nominal mode: AT#4-B-J2-DL4-DDL7-IP4 AT#3-B-J2-DL2-DDL8-IP2
Sun 29/3/09	1 night	AT#3 (failure of VCMB-AT4)	Cyclop mode: AT#3-B-J2-DL2-DDL8-IP2

During the first 3 days, we had to tackle some non expected alignment problems. We identified that PRIMETB, Marcel and the FSUB were not co-aligned (see section 4.4). The roof mirror of Marcel (common to IP2 and Ip3) has moved during COM4 (see section 5.1 and 11).

Data taken during the PRIMET beam tracking tests are not valid. The (X,Y) circular modulation commands sent to the STS-VCM had an incorrect phase shift. What initially looked like a circular modulation was in reality periodical jumps on a circular trajectory between points separated by 120 deg. This problem was unfortunately only detected while processing the data after COM4. PRIMET BTK tests must be conducted again in the next COM periods.

Pupil tracking worked without problem.
However the residual pupil motions observed AT#4-STS were larger compared to the previous commissionings (except the first night). The residuals were dominated by a 1 Hz eigenfrequency whose origin remains to be found. The impact of various configurations on the interaction matrix of the pupil tracking was studied (see section 10).

PRIMET B operation in "Cyclop" Mode:

Beam quality after retro-reflection through the overall PRIMA optical train (i.e.BC,DDL, DL, STS)

The beams injected in free space at the output of the PRIMETB injection block (see section 3.4) are characterized by the beam profiler:

P beam (going to IP4): P_{ip}=24.8 mW ; (ϕ~740 μm; ε=0.99)
S beam (going to IP2):P_{is}=27 .56 mW (ϕ~726 μm; ε=0.99)

The beams detected by the beam profiler located on the PRIMETB extraction block (see **Figure 3**) are characterized by:

section 6.2.1:	(IP2 BC DL4 DDL8 AT#4-J2-STS/B)	S Beam:	ϕ=1348 μm , P_s=0.033 mW, ε=0.96
section 6.5:	(IP4 BC DL4 DDL7 AT#4-J2-STS/B)	P Beam:	ϕ=1169 μm , P_p=0.037 mW, ε=0.94
section 7.2:	(IP2 BC DL2 DDL8 AT#3-G2-STS/B)	S Beam:	ϕ=1048 μm , P_s=0.050 mW, ε=0.85
	(IP4 BC DL4 DDL7 AT#4-J2-STS/B)	P Beam:	ϕ=? P_p~0.048 mW, ε=?

The whole free space transmission between the output of the PRIMET B injection block and the input of the PRIMETB extraction block (i.e. before BS1 of Figure 3**) is**
$\mathbf{T_s}$~$P_s/P_{is}/(T_{BS1}.R_{BS2})$= 0.033/27.57/0.195=**0.6%**
$\mathbf{T_p}$~$P_p/P_{ip}/(T_{BS1}.R_{BS2})$= 0.037/24.8/0.195=**0.76**%

Note:
-These values take into account $T_{BS1}.R_{BS2}$=0.195 measured in section 5.3
- The STS was NOT in calibration mode
- The power measured by the beam profiler is not calibrated. In the AIV report, we showed that for one of the two available beam profilers, $P_{Calibrated}=P_{Beam\ profiler}/2.473$.

Switchyard encoder position

In order to center the metrology beams on the alignment plates located at the entrance of the DL tunnel, we had to adjust the positions named *BC-DDL* for Switchyard#2 and Switchyard#4.

- *Switchyard#4: enc 221818 instead of enc.222000 (BC-DDL#7)* : This tilt adjustment is equivalent to a shift of 9.4 pixels on IRIS (see section 6.5). As shown in section 11, Marcel Ip4 was correctly aligned and the FSU-ACU positions for IP4 had been set after a BTK on Marcel/IP4. One point remains to be clarified: to which extend did the re-alignment of the overall PRIMET injection block (see sections 5.2 and 7.2) contribute to the redefinition of this encoder position?
- *Switchyard#2: enc 230365 instead of enc.230404 (BC-DDL#8)* : This tilt adjustment is equivalent to a shift of 2 pixels on IRIS (see section 6.2.2). In that case, two sources of errors may have contributed to this shift:i/ a wrong FSU-ACU position because Marcel IP2 was not aligned (see section 11),ii/ the re-alignment of the overall PRIMET injection block as mentioned above.

DDL motion

The DDL tacReport files show that during a preset of the DDL (SETAPOS) over the full stroke , the sampling time used to generate the trajectory exhibits a "pattern of delay" every 10msec. The trajectory error is dominated by an error of the mechanical position of 6 microns PV at 101.9 Hz (see section 6.5). This error is also seen on the PRIMETB metrology signal.

The same kind of error appears during a (simulated) fringe search trajectory. The OPL error recorded by PRIMET over a fringe search of δOPL=178 microns is ε_{opl}=500nm (PV). The high frequency OPL error is dominated by PV=300nm at 45.6 Hz

The preset of the DDL (SETAPOS) and the fringe search (change of the search direction) introduce large lateral beam displacements (mainly along Y) which cannot be corrected by the pupil tracker. Although no glitch occurred in cyclop mode and even when operating with 2xDDL and 2 AT's during the last ½ night of COM4 , this pupil motion may represent a show stopper in some real operating conditions. So, we need i/to clarify how the tilt of the DDL M3 is currently adjusted during SETAPOS ii/ foresee to limit the speed at which the inversion of the fringe search direction is performed.

The lateral displacement of PRIMET IP4 introduced by the motion of DDL7 over its full stroke was measured twice: 175 μm (PV) (section 6.5) and 262 μm (PV) (section 7.3)
(impact of the operation of the DDL M3 is TBC)

PRIMET B in the PRIMA operational conditions (2xAT's and 2xDDL)
PRIMETB was successfully operated with 2xDDL and 2AT-STS during the last ½ night of COM4. The enclosures were opened. The robustness of PRIMETB was tested in several conditions: preset of 1 DDL, fringe search with 1 DDL, DL tracking at 5mm/sec in parallel with DDL fringe search. No glitch occurred.
These tests shall be repeated in particular for larger DL OPLs.

Perspectives for COM6

- co-alignment of PRIMETA/B and FSUA/B (day-time)
- Study the problem of low fringe contrast on PRIMETB-Marcel
- operation of PRIMETA/B through DDL and up to 2 AT-STS (day-time+ beginning of the night)
- evaluate the robustness of PRIMET along the overal DL stroke (need automatic adjustment of the VCM pressure versus OPL)
- Install and test the repaired fringe tracking board
- Elaborate and test a procedure to check if the STS_VCM is operating properly if the beam is not retro-reflected from the STS.
- Test PRIMET BTK with the new software version
- Operate and check PMCS with Ocatarinetabellatchitchix
- Elaborate a procedure for Health check and Day-to-Night: e.g check automatically that data taken on Marcel for the FSU calibration are valid by moving LMOT
- Prepare dedicated LAN for next COM's with new stations
- Check PRIMET and DDL Met scaling (SETAPOS with well defined amplitudes in the tacReport and lprmac files)
- test priguiStatus ignore functions and PMCS. Check if PRIMET engineering Gui's can be operated in parallel even if the corresponding LCU has been ignored.

Software Related fixes/changes needed for COM6

Pmacq

- add label "Glitch counter" on pmacq done
- Check the computation of the visibility from the fringe board data
- generate new engineering file to log rms and DC values from the fringe tracking board
- merge pmacqui A_B and –B in 1 panel (e.g.with tabs) if possible done

lprmacFringe2008-11-29T01.37.25.000000.txt

```
Date/Start time: 2008-11-29T01.37.25.000000
Sampling frequency in Hz: 1000
Configuration:
CHA: UNDEF
  Ip3 (+38.65 MHz)
  Ip1 (+38.00 MHz)
CHB: FSU B
  Ip4 (-39.55 MHz)
  Ip2 (-40.00 MHz)
Laser Frequency (nm): 1319.00
Frequency Shift (MHz): 78.00
Index of refraction: n=1
Number of Samples: 47534
Definition of the columns:
RelativeTime, DC_REF_450kHz,RMS_REF_450kHz,V_REF450kHz  X4
```

Pmpsd

- Correct PRIMET BTK modulation and sampling time errors done
- Check the delay used before evaluating the "loop stable" conditions once the loop is closed: to be made configurable: <ATTRIBUTE>: strtmpoWaitTime <TYPE>: Scalar done
- Correct the 2nd line of the centroids and corrections files: it should be "`% Sampling frequency in Hz: `"done
- add IM and loop parameters in the header of the engineering file done

% Parameters of the controllers
% IP3 IM Gain A1 A2 B1 B2 1 0 0 1 -0.015 -1.8904 0.8921 -1.999 0.999
% IP1 IM Gain A1 A2 B1 B2 1 0 0 1 -0.015 -1.8904 0.8921 -1.999 0.999
% IP4 IM Gain A1 A2 B1 B2 1 0 0 1 -0.015 -1.8904 0.8921 -1.999 0.999
% IP2 IM Gain A1 A2 B1 B2 1 0 0 1 -0.015 -1.8904 0.8921 -1.999 0.999

PMCS:

- Check PMCS for several operation scenari: e.g. Single-feed observation with FSU using the STS, etc…

Test Script:

- health check script; day-to-night script

General:

- documentation and explanation of all parameters of the dbcfg (especially pmpsd)
- Suggest to rename Marcel beams according to IP's and not A,B,C,D,E,F…
- Suggest to operate the DDL in OPL units to match the main DL

13 APPENDIX

13.1 Usefull Gui's and Instructions

13.1.1 DL

wdline -l dl
dlpsrvgui &
dlguiStatus
vcmgui &
vcmwsgui & : allow to read Pin Pout and to define POutOffset
Pin and Pout includes the mechanical position of the DL !

How to make the DL vcm track on its Pin Pout while the DL is moved

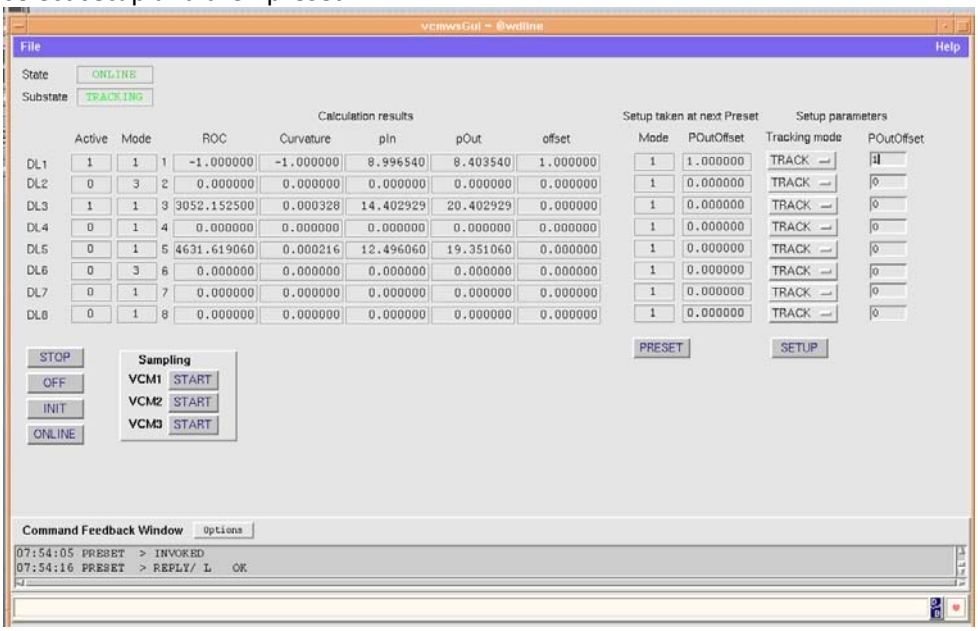
on dlguiStatus

check that all needed components are ONLINE
vcmws Online Tracking
VCMX online Tracking
other ignored

Define parameters of the delay line
Under wdline

get the current configuration of the DL
msgSend wdline dlmswControl GETDELD "dl4"
this returns
DLID, TEL ID, STATION ID,STATION POS U, STATION POS V,STATION POS W,
OPL0,InputCHannel,PupilIN,PupilOUt,OPDfilename
set the current configuration of the DL
msgSend wdline dlmswControl SETDELD dlmswControl "……."
note: OPL0 is not important
PupilIN,PupilOUt corresponds actually to a PupIn0 and PupOut0 !!! (see ISS doc)

under vcmwsgui
select setup and then preset



vcmwsgui Pin and Pout includes the position of the DL !!!!!!
POutOffset is defined before the BC
for an Offset X after the BC, POutOffset must be set to X.(4.44)^2~20.X
Matlab code ComputeVCMParametersATBC requests offset after the BC (=X)

then move the DL using

dltestTrack ldlnumber startOPL speed in mm/s

(Check that PoutOffset is taken into account)

13.1.2 DDL and DOPDC

to be completed

13.1.3 FSU

wprima
pfcsguib
pfcsguia

pfacuguia
pfacuguib

pfttpguia
pfttpguib

to get the flux on rtdscope, one has to use the rmn monitor

rlogin wvgmon –l mon
rtdscopGui &
(the metrology need to be online,at least one pmacqgui to work !)
if not try to restart some irace tasks by typing:
rtdscop –e lvmon –n rtdscop_lvgmon &

If RTDscope does not display any data:
rlogin wvgvlti -l mon (Password: the "nice" one)
check if the rtdscope process died:
-> psg rtd
if the rtdscope process is not listed:
->rtdscop -e lvgmon -n rtdscop_lvgmon &

to do spiral search and do BTK need to select
OPMODE in AUTOTEST
for pfttpgui and pfacugui
(different from sky positions)

13.1.4 IRIS

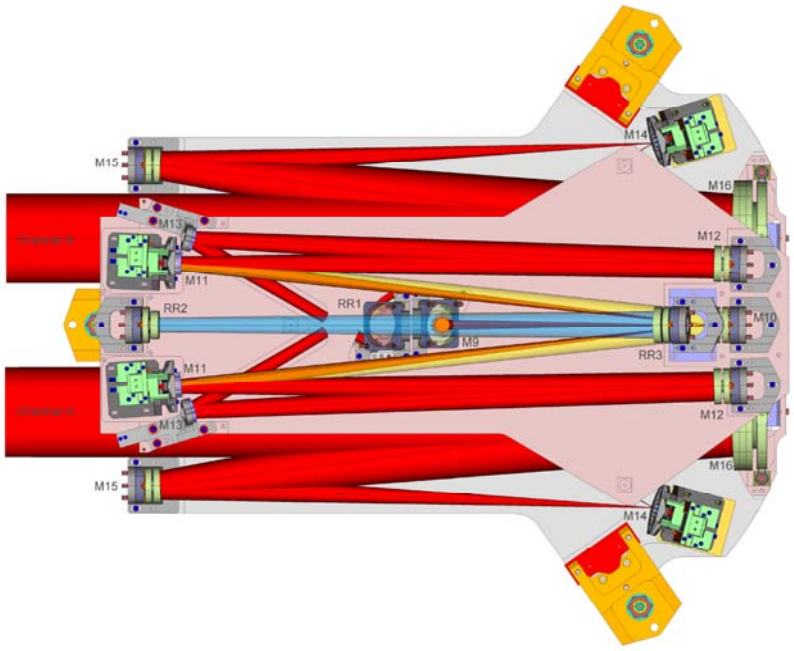
waral

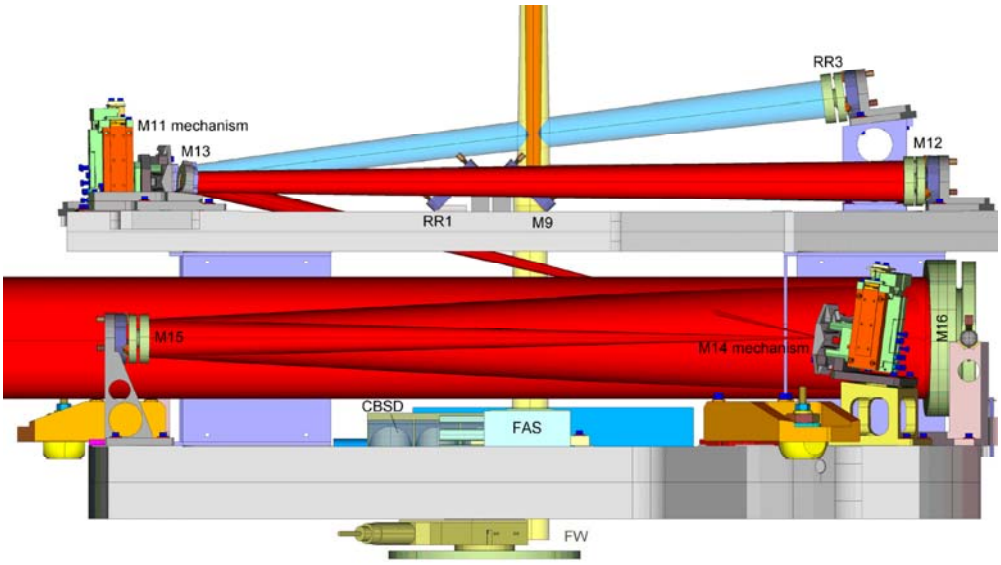
irisguiEngineering
irisrtd

13.1.5 STS

Export LCUENV =latXvcm
vcmgui &

pspzgui –l latXvcm
pspzgui –l latXfsm





13.1.6 M16

waral -l aral
m16gui &

13.1.7 Laboratory and ARAL TCCD

waral –l aral
aripanControl &

sometime it is shut down and one as to start again from aropanControl
aropanEngineering &arinsStart

retrieve IRIS centroids on AUTREP
(measured evry day during calibration procesure at ~ 8h00 LT)

1/ waral cd /vltdata/tmp/
grep MARCEL logFile
or grep MARCEL waral.yyyy-mm-dd.ops.log

de 12h UT (8h00 Local) a 12h UT
during COM4 : date of the filename corresponds to date when the measurements were performed

or

2/
go to :
http://autrep.pl.eso.org/autrep2/pages/autwebLabRep.php
then copy the following test and chose database connection: GARCHING

```
#*********************************************************************
# E.S.O. - VLT project
#
# who       when       what
# --------  --------   ----------------------------------------------
# smorel    2009-01-26   created

#*********************************************************************
#
#  Script to monitor the position of the MARCEL spots on IRIS
#
#*********************************************************************

report_body (DataReport)

ops_plot (marcel_A.gif)
  plot_info (MARCEL beam A position, Day,Pixel)
  plot_number_axis_y (2)
  plot_mark (3)
  ops_plot_add (waral,INS IRIS H_XMARCELA, X,0,24)
  plot_mark (7)
  ops_plot_add (waral,INS IRIS H_YMARCELA,Y,0,24)
ops_plot_end

ops_plot (marcel_B.gif)
  plot_info (MARCEL beam B position, Day,Pixel)
  plot_number_axis_y (2)
  plot_mark (3)
  ops_plot_add (waral,INS IRIS H_XMARCELB,X,0,24)
  plot_mark (7)
  ops_plot_add (waral,INS IRIS H_YMARCELB,Y,0,24)
ops_plot_end

ops_plot (marcel_C.gif)
  plot_info (MARCEL beam C position, Day,Pixel)
  plot_number_axis_y (2)
  plot_mark (3)
  ops_plot_add (waral,INS IRIS H_XMARCELC,Beam C X,0,24)
  plot_mark (7)
  ops_plot_add (waral,INS IRIS H_YMARCELC,Beam C Y,0,24)
ops_plot_end

ops_plot (marcel_E.gif)
  plot_info (MARCEL beam E position, Day,Pixel)
  plot_number_axis_y (2)
```

```
  plot_mark (3)
  ops_plot_add (waral,INS IRIS H_XMARCELE,Beam E X,0,24)
  plot_mark (7)
  ops_plot_add (waral,INS IRIS H_YMARCELE,Beam E Y,0,24)
ops_plot_end

ops_plot (marcel_F.gif)
  plot_info (MARCEL beam F position, Day,Pixel)
  plot_number_axis_y (2)
  plot_mark (3)
  ops_plot_add (waral,INS IRIS H_XMARCELF,Beam F X,0,24)
  plot_mark (7)
  ops_plot_add (waral,INS IRIS H_YMARCELF,Beam F Y,0,24)
ops_plot_end

report_end
```

13.1.8 TCCD of the AT's

rtd –camera ccdagfas &

13.1.9 PRIMET

13.1.10 PRIMA recorder etc..

13.1.11 ISS

telnet wvgvlti (rlogin does not work)
user: iss
PWD:

issguiConfig &

13.2 Preparation VCM tracking test with DL

AT#4-J2 DL#4

Theoretical STS-VCM curvature:

****
Station J2
Delay Line DL#4
****
VCM_STS
****
STS VCM ROC is: -2.098233e-001 (m) (includes OFS constant)
STS VCM curvature is: -4.765915e-003 (mm-1)
Pout is: 9.089870e+001 (m)
****

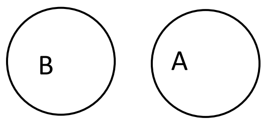
Theoretical DL-VCM Curvature as a function of the position with zero offset

example:
ComputeVCMParametersATBC('UT4',4,4,0,0,-1)
Telescope = UT, Station = UT4, DL 4 @ Position 0.000000 m, Lab Input Channel #4, Pupil offset after BCs 0.0 m,

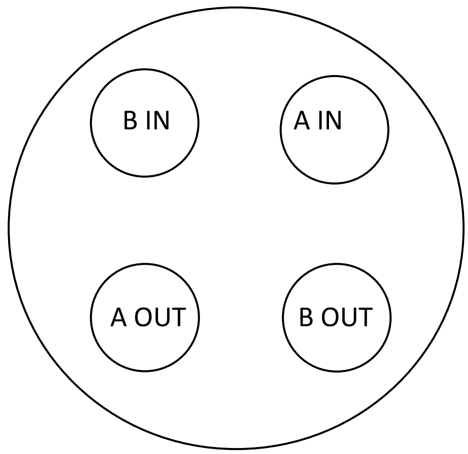
> Input pupil distance (*) = 9.842000e+000 m =PupIn0 in particular case of position=0
> Exit pupil distance required = 1.608200e+001 m =PupOut0
> VCM radius required (with specific DL optical par.) = 4.373521e-005 mm-1
To be used in SETDELD (TBC)

ComputeVCMParametersATBC('UT4',4,4,7,0,-1)
Telescope = UT, Station = UT4, DL 4 @ Position 7.000000 m, Lab Input Channel #4, Pupil offset after BCs 0.0 m,

> Input pupil distance (*) = 1.684200e+001 m = 7m added compared to above
Pin to be seen on vcmwsgui
> Exit pupil distance required = 2.308200e+001 m = 7m added compared to above
Pout to be seen on vcmwsgui
> VCM radius required (with specific DL optical par.) = 5.820640e-004 mm-1



As seen towards the STS or from the BC towards the tunnel



As seen towards the DL
Always true: north or south station, east or west DL

<u>Test identite des donnees Matlab et VLTI SW</u>

Control Model DL1,3,5 uniquement dispo

ComputeVCMParametersATBC('UT1',1,1,0,0,-1)

Telescope = UT, Station = UT1, DL 1 @ Position 0.000000 m, Lab Input Channel #1, Pupil offset after BCs 0.0 m,

~~~~~~

> Input pupil distance (*) = 9.092000e+000 m PupIn0
> Exit pupil distance required = 7.499000e+000 m PupOut0

ComputeVCMParametersATBC('UT1',1,3,0,0,-1)

Telescope = UT, Station = UT1, DL 1 @ Position 0.000000 m, Lab Input Channel #3, Pupil offset after BCs 0.0 m,

~~~~~~

Input pupil distance (*) = 9.092000e+000 m PupIn0
Exit pupil distance required = 1.175200e+001 m PupOut0

msgSend wdline dlmswControl SETDELD dlmswControl "……."
DLID, TEL ID, STATION ID,STATION POS U, STATION POS V,STATION POS W, OPL0,InputCHannel,PupilIN,PupilOUt,OPDfilename

Put DL#1 at pos=0
Check on the vcmwsgui that Pin and Pout corresponds to

ccseiMsg on the dlmswControl Process

AT#3-G2 DL#2

****
Station G2
Delay Line DL#2
****
VCM_STS
****
STS VCM ROC is: -7.313170e-001 (m)
STS VCM curvature is: -1.367396e-003 (mm-1)
Pout is: 3.214870e+001 (m)
****

Date	Config	DL	DDL	DL-VCM-Curv	STS-VCM Curv
AIV 19/8/08	Ip3-Marcel	-	-	-	-
	Ip4-BC-DL#4-B-AT#4-J2	15	-	Theory: 4.037793e-3 mm-1 (ROC=247.66 mm) Real: (1.3 Bar)	Theory: -4.765915e-3 mm-1 (ROC=-209.8 mm) Real: 3.878e-3 (1.7 bar)
	Ip1-BC-DL#2-A-AT#3-G2	15	-	Theory: 3.739813e-3 mm-1 (ROC= *267.39* mm) Real: -4.75552e-3 (2.1 bar)	Theory: -1.367396e-3 mm-1 (ROC=-731mm) Real: INF (flat)
	Ip2-BC-DL#2-B-AT#3-G2	15	-	Theory: 3.730580e-3 mm-1 (ROC=*268.05* mm) Real: -4.75552e-3 (2.1 bar)	Theory: -1.367396e-3 (ROC=-731mm) Real: INF (flat)
COM1 Oct'08	Ip3	-	-		
	Ip4-BC-DL#4-B-AT#4-J2	14		Theory: 4e-3 mm-1 (ROC=250 mm) Real:4e-3 mm-1 (1.7598 bar)	Theory: -4.765915e-3 mm-1 (ROC=-209.8 mm) Real: 4.011e-3mm-1 (1.75 bar)
	Ip1	-	-		
	Ip2	-	-		
COM2 Nov'08	Ip3				
	Ip4-BC-DL#2-B-AT#4-G2			Theory: 3.855718e-3 mm-1 (ROC=259.35 mm) Real:4e-3 (1.72 bar): by mistake	Theory: -1.367396e-3 (ROC=-731mm) Real: 5.1e-4mm-1 (0.1125 bar)
	Ip1				
	Ip2				
COM3 Jan'09	Ip3	-	-		
	Ip4-BC-DDL7-DL#4-B-AT#4-J2	14	?	Theory: 5.820640e-4 mm-1 (ROC=1718 mm) Real=theory	Theory: -4.765915e-3 mm-1 (ROC=-209.8 mm) Real= theory
	Ip1	-	-		
	Ip2	-	-		
COM4 Mar'09	Ip3				
	Ip4-BC-DDL7-DL#4-B-AT#4-J2	14	?	Theory: 5.820640e-4 mm-1 (ROC=1718 mm) Real=theory	Theory: -4.765915e-3 mm-1 (ROC=-209.8 mm) Real: 4.7e-3mm-1 (1.93 bar)
	Ip1				
	Ip2-BC-DDL8-DL#2-B-AT#3-G2	30m	?	Theory: 8.888776e-004 mm-1 (ROC= 1125.01mm) Real:20.32e-4 (0.8bars)	Theory: -1.367396e-3 (ROC=-731mm) Real: INF (flat)

During AIV and COM1: wrong calibration of pressure-curvature for AT#4-VCMB (old version of DL#1 VCM vcm1.dbcfg instead of vcm2.dbcfg on lat4vcm)
ComputeVCMParametersATBC('UT4',4,4,7.5,4.5,-1)= 4.037793e-003 mm-1 ROC= 247.66 mm
ComputeVCMParametersATBC('UT2',2,1,7.5,4.5,-1)= 3.739813e-003 mm-1 ROC= 267.39 mm
ComputeVCMParametersATBC('UT2',2,2,7.5,4.5,-1)= 3.730580e-003 mm-1 ROC=268.05 mm

COM1
ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1)= 4e-3 mm-1 ROC=250 mm

COM2
ComputeVCMParametersATBC('UT2',2,4,7,4.5,-1)= 3.855718e-003 mm-1 ROC=259.35 mm

COM3
ComputeVCMParametersATBC('UT4',4,4,7,0,-1)= 5.820640e-4 mm-1 ROC=1718 mm

COM4
ComputeVCMParametersATBC('UT4',4,4,7,0,-1)= 5.820640e-4 mm-1 ROC=1718 mm
ComputeVCMParametersATBC('UT2',2,2,7,0,-1)= ROC= 3657 mm
VCM radius out of range [150 mm ... 2800 mm] !
Need to put DL at least at MechPos=8.05m
for OPL=30 m (MechPos=15m)
ComputeVCMParametersATBC('UT2',2,2,15,0,-1)= 8.888776e-004 mm-1 ROC= 1125.01mm

13.3 Configuration of the STS-VCM and DL-VCM

AT#4-STS A&B-J2-DL#4							
FSM				VCM			
Mirror 1=Beam A		Mirror 2= Beam B		Mirror 1=Beam A		Mirror 2= Beam B	
Xedge=30.5	*Yedge=30.5*	Xedge=12.5	Yedge=12.5	*Xcenter=19*	*Ycenter=19*	Xcenter=26.5	Ycenter=10.5
X=	*Y=*	X=	Y=	*X=-*	*Y=-*	X=	Y
				Fixed curvature mirror ROC=infinity ? (C=0 mm^{-1})		ROC=-210.83 mm, C= -4.743185e-003 (mm-1) (theoretical value) See Com1 report	

DL	OPL	VCM Curvature/pressure
DL#-ip2	N/A	N/A
DL#4-ip4	14	ComputeVCMParametersATBC(TelescopeStation,DL,IP,DLPOS,pupil Offset,-1) ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1) =3.999341e-003 mm-1 ComputeVCMParametersATBC('UT4',4,4,7,0,-1)= 5.820640e-004 mm-1

FSUB ACU	X	Y
TTP1		
TTP2		

FSUB LMOT	Position
LMOT1	
LMOT2	0

13.4 Field orientation on the TCCD

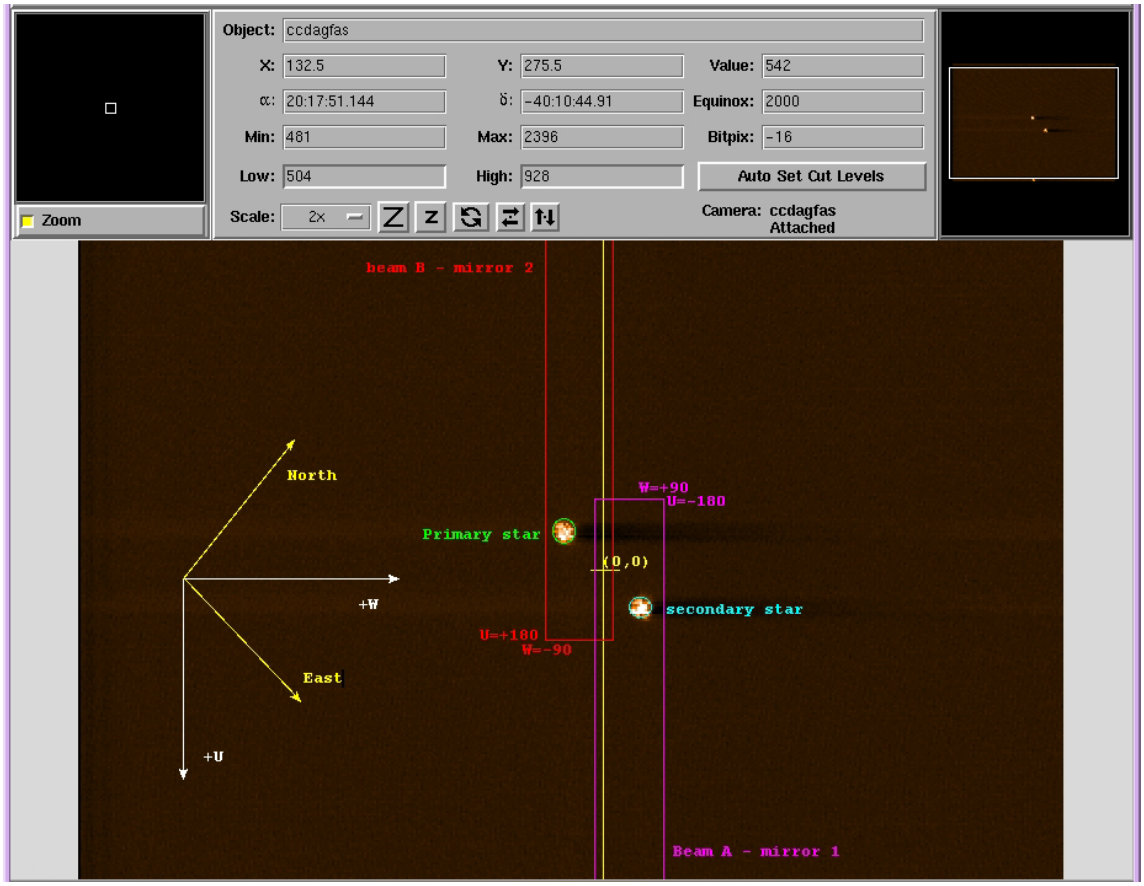


Figure 4: For example only: AT#3-STS (G2) during AIV

__oOo__