E U R O P E A N   S O U T H E R N   O B S E R V A T O R Y
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VERY LARGE TELESCOPE

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CHANGE RECORD

Issue	Date	Affected Paragraphs(s)	Reason/Initiation/Remarks
1	14/11/2008	All	First issue

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1 INTRODUCTION

This document reports the results obtained during the PRIMET AIV-COM1 period held on October 16-26/2008, with the support of **R.Frahm, N.DiLieto and P.Gitton**.

PRIMET was in the configuration left after AIV (July- August 2008), which is documented in the PRIMET AIV report **VLT-TRE-ESO-15730-4637**. We recall that during the PRIMA AIV, the following PRIMET tasks and milestones were achieved:

- Integration and alignment of all PRIMET opto-mechanical components for observations on Marcel and on AT#3-G2-DL#2 & AT#4-J2-DL#4.
- Demonstration that PRIMET can be operated safely.
- Demonstration that the laser frequency stabilization is operational.
- ***PRIMET milestone 1***: PRIMET operates on Marcel and is “released” for FSU calibration.
- PRIMET First fringes on 2 AT’s.
- Verification that all engineering commands are correctly executed (apart from pupil tracking).

The objective of the October 2008 was to complete some AIV tasks as defined in appendix, with the limitation of having only 1 STS on J2 equipped with only 1 inflatable VCM on Beam B. So, we were NOT yet able to attempt the next milestone "***PRIMET milestone 2***: PRIMET “first fringes” on 2 AT’s, including pupil tracking, without DDL" .

As a pre-requisite, the dedicated LAN connection for the J2 station was checked.
The support of “Paranal Optics” was requested for 0.5 day (mount/dismount the sighting scopes) as well as a telescope operator (open/close AT-STS enclosure each night during PRIMET tests).

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

Considering the little time available, the focus was put on PRIMETB to limit conflicts with FSUA commissioning activities. It is not possible to observe simultaneously on FSUA-AT and PRIMETB-AT/STS because the M16 position does not match.

2 CONFIGURATION

PRIMET used the following configuration:
<u>AT#4-STS (used as Telescope 2)</u>
Station J2-DL#4
AT#4-STS had the VCM installed on Beam B
AT#4-STS was equipped with its derotator and its TCCD
The Beam A of AT#4-STS was equipped with a fixed curvature VCM, defined by the position of the J2 station with a ROC of 200 mm. (theoretical for J2 ROC=210mm, or 4.762×10^{-3}mm^{-1})

<u>Marcel (used as Telescope 1)</u>
BSB_E (autotest) **ip#2-Beam B**
BSB_A (autotest) **ip#1_Beam A**

The M16 configuration is indicated in the next figure

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)

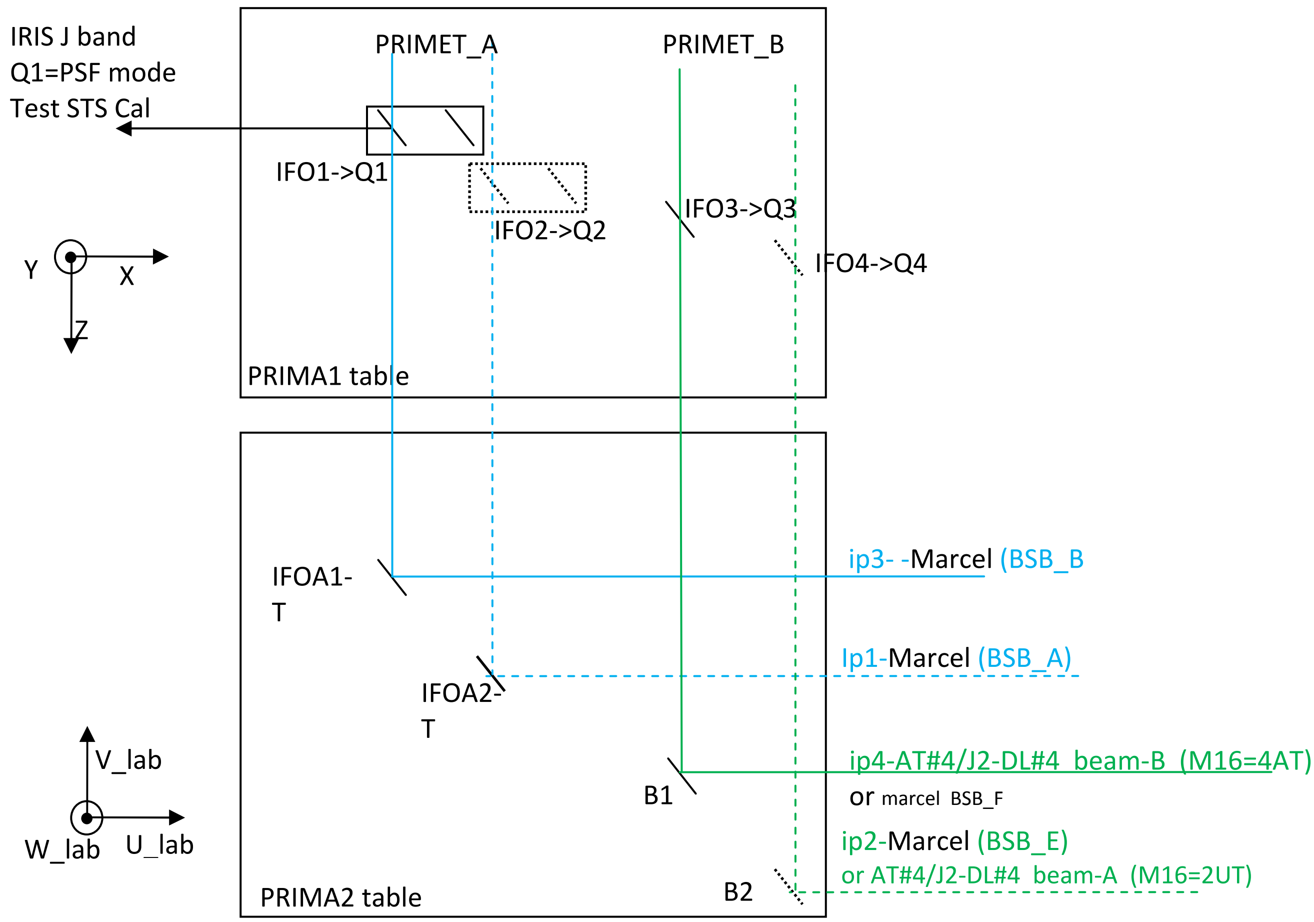


Figure 1: Beam routing used during AIV-COM1

AT#4-STSA&B-J2-DL#4 only used with PRIMET B							
FSM				VCM			
Mirror 1=Beam A IP2-DL#4 (Not Standard config)		Mirror 2= Beam B IP4-DL#4		*Mirror 1=Beam A* *IP2-DL#4* *(Not Standard config)*		Mirror 2= Beam B IP4-DL#4	
Xedge=30.5	*Yedge=30.5*	Xedge=12.5	Yedge=12.5	*Xcenter=19*[1]	*Ycenter=19*	Xcenter=26.5	Ycenter=10.5
X=	*Y=*	X=	Y=	*X=-*	*Y=-*	X=	Y
U=	*W=*	U=	W=	*U=-*	*W=-*	U=	W=
				Fixed curvature mirror *ROC=200 mm* *($C=5\times10^{-3}$ mm^{-1})*		ROC=210.8mm, $C= 4.743\times10^{-3} mm^{-1}$ [(2)] (theoretical value)	

DL	OPL	VCM Curvature/pressure
DL#4-ip4 and ip3	14	$4. \times10^{-3}$ mm^{-1} [(3)] (theoretical value)

FSUB ACU	X	Y
TTP1	-13×10^{-6}mech. rad	16×10^{-6} mech. rad
TTP2	358×10^{-6} mech. rad	146×10^{-6} mech. Rad

FSUB LMOT	Position
LMOT1	-134077 counts
LMOT2	0

---

[1] Default values. They could not be checked in the AT hall (physical problem with a pillar blocking the access for optical alignment)

[2] See section 3.2.1

[3] See section 3.2.2

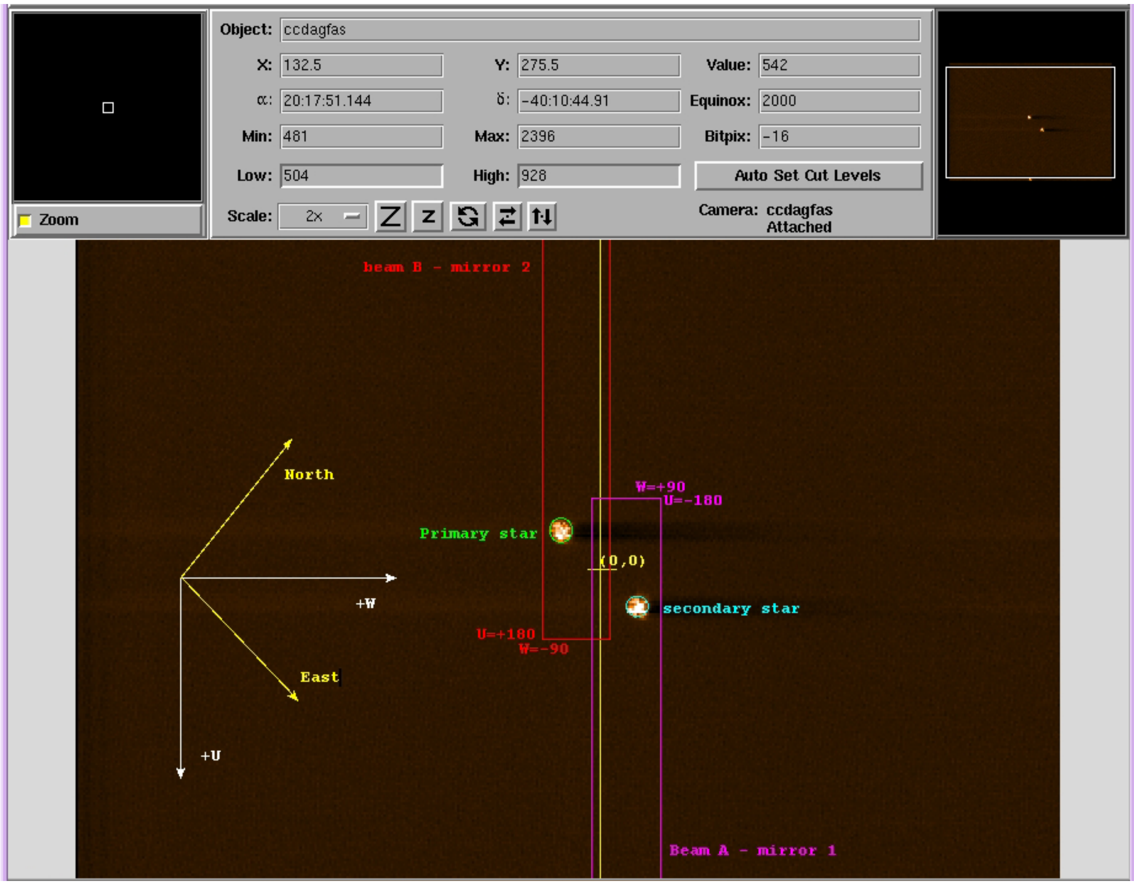


Figure 2: For example only: AT#3-STS (G2): Orientation and scale of the image plane on the STS TCCD (image generated by Francoise). Orientation TBC for AT#4 (south station)

3 17-22/10/2008

3.1 PRIMET Start-up

All PRIMET functions were started without problem.
Fringes were recorded immediately on Marcel.
No re-alignment needed after not being used for 1.5 month.

3.2 Pupil re-imaging

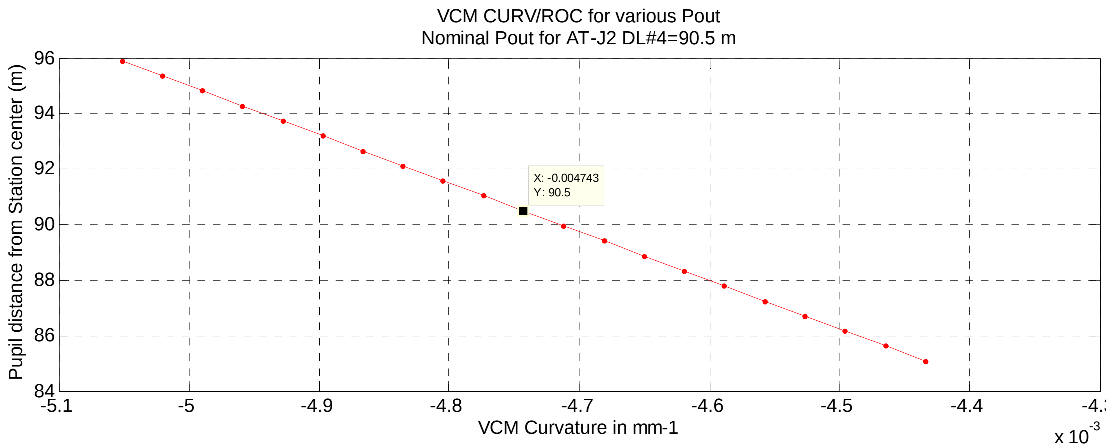
3.2.1 Theoretical relation between STS-VCM curvature and STS output pupil position

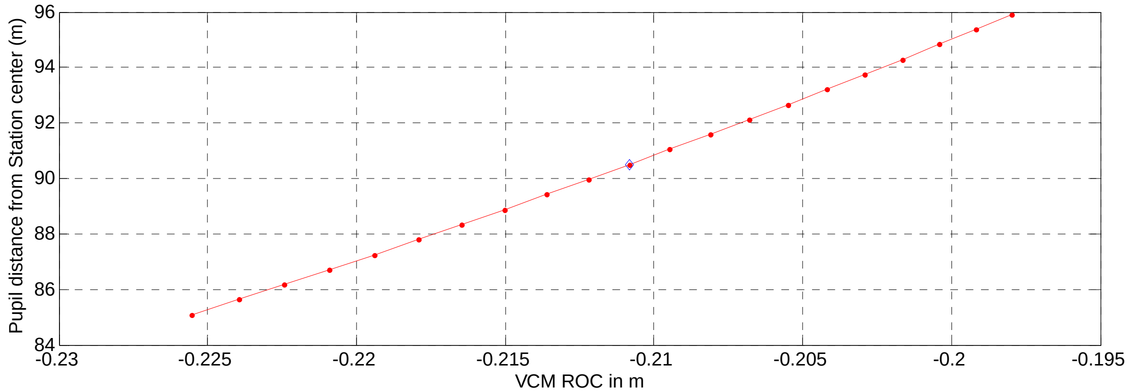
For AT-J2 and using DL#4, the goal is to bring the output pupil at UTExitPupiluCoordinate = 54.125 m.
The theoretical STS-VCM curvature is:

```
****************
   VCM_STS
****************
STS VCM ROC is: -2.108288e-001 (m)
STS VCM curvature is: -4.743185e-003 (mm-1)
Pout is: 9.050000e+001 (m)
****************
```

```
% StationCoord case 'J2'
        StationPosition = struct('u',88.,'v',-96.);
% UT output pupil position along u in meters for DL4
        UTExitPupiluCoordinate = 54.125;
% DL axis position along v for DL4
        DLPosition = struct('v', -39.375, 'u0', 44.283);
% DLPosition.vInRef = DLPosition.v + 0.12; not taken into account

[R_nom,Curv_nom,Pout_nom] = VCM_STS([StationPosition.u,StationPosition.v], UTExitPupiluCoordinate,
DLPosition.v)

% I scan the UTexitPupil by +/- a %
a=10/100

UTExitPupiluCoordinate = 54.125*[1-a:a/10:1+a]
[R,Curv,Pout] = VCM _STS([StationPosition.u,StationPosition.v], UTExitPupiluCoordinate, DLPosition.v)

 figure(1);
 subplot(2,1,1); set(gca,'FontSize',13);
 plot(Curv,Pout,'r.-',Curv_nom,Pout_nom,'bd');grid
 xlabel('VCM Curvature in mm-1')
 ylabel(' Pupil distance from Station center (m)')
 title({['VCM CURV/ROC for various Pout'],['Nominal Pout for AT-J2 DL#4=90.5 m']})
 subplot(2,1,2); set(gca,'FontSize',13);
 plot(R,Pout,'r.-',R_nom,Pout_nom,'bd');grid
```

```
xlabel('VCM ROC in m')
ylabel(' Pupil distance from Station center (m)')
```





By fitting the data:
P_{out}(m)= -17538×VCM_CURV(mm^{-1}) + 7.38
DP_{out}/DC= -17538 m/(mm^{-1})

3.2.2 Theoretical curvature of DL#4 VCM

Theoretical DL#4 VCM curvature is given by the following matlab code:
ComputeVCMParametersATBC(TelescopeStation,DL,IP,OPL,pupil Offset,-1)

Case 1: no offset in the VLTI lab:
- ComputeVCMParametersATBC('UT4',4,4,7,0,-1) = 5.820640e-004 mm-1

Case 2: offset of 4.5 m in the VLTI lab to match PRIMA configuration
- ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1) =3.999341e-003 mm-1

3.2.3 Impact of the VCM curvature-pressure calibration error (STS-Beam B)

The calibration pressure-curvature of the VCM of AT#4-STS currently used by the VCM software is not the correct one (VCM2.dbcfg on lat4vcm). The parameters are taken from an old version of DL#1 VCM. (vcm1.dbcfg file stored in VCM module version 1.81 March 2006).

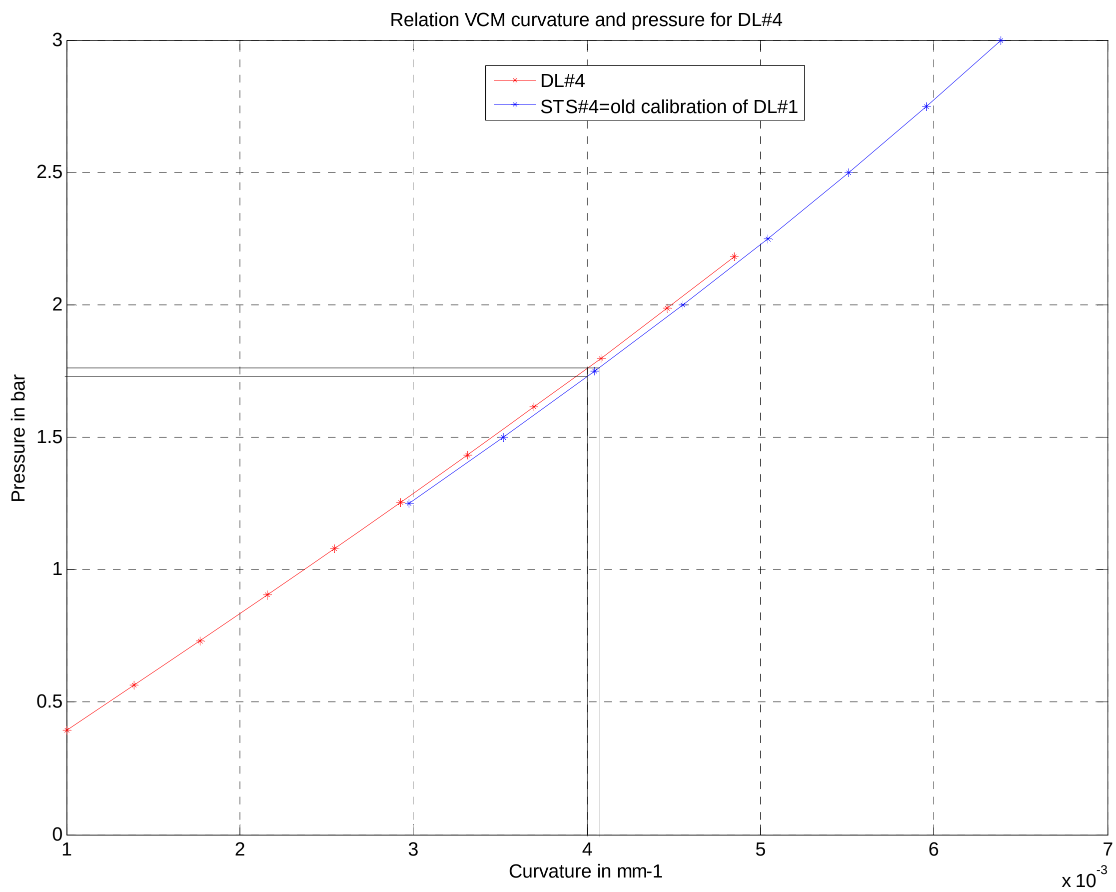


Figure 3: Relation pressure-curvature as indicated on the vcmGui

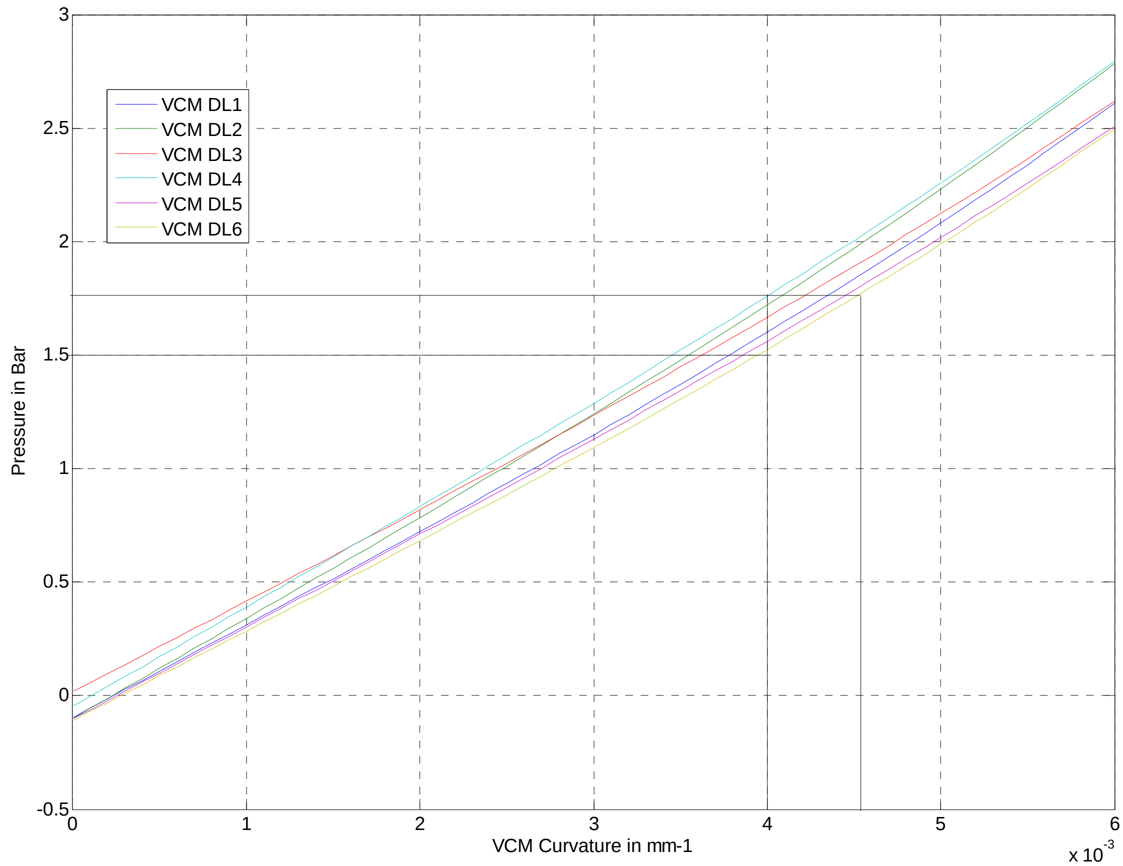


Figure 4: Relation pressure-curvature for all DL_VCM as implemented at Paranal (source vcmX.dbcfg)

Estimation of the impact of modelling errors P=Funct.(Curv) on Pout.
What happens if P=Funct.(Curv) implemented for AT#4-STS-VCM is different from the "true" one, as much as the dispersion between the functions of the DL-VCM ?

Based on Figure 3**:**
P_{dl}=k.C+b1
P_{sts}=k.C+b2
Calibration error for same requested curvature: DP=(b2-b1)~0.03 bar using DP/DC~ 511.54 bar per mm^{-1} (similar for DL or STS VCM, computed using Matlab linear fit)

For DP=0.03 bar DC~5.8×10^{-5} mm^{-1}
The corresponding longitudinal pupil shift (DP_{out}) can be estimated using the result of the previous section
$DP_{out}=[DP_{out}/DC] \times DC = -17538\ m/(mm^{-1}) \times 5.8 \times 10^{-5}\ (mm^{-1}) \sim 1m$
This corresponds to $1m/(4.44^2)$~ **5 cm after the beam compressor** …

Based on Figure 4 **(worst case)**
P_{dl}=k.C+b1
P_{sts}=k.C+b2
Calibration error for same requested curvature at C~4mm-1: DP=(b2-b1)~0.25 bar using:
DP/DC~ 511.54 bar per mm^{-1} as in the previous case

For DP=0.25 bar DC~4.89e-4 mm^{-1}
The corresponding longitudinal pupil shift (DP_{out}) can be estimated using the result of the previous section
DP_{out}=[DP_{out}/DC] × DC = -17538 m/(mm^{-1}). 4.89e-4 (mm^{-1})~ 8.6m

This corresponds to 8.6m/(4.44^2)~ **44 cm after the beam compressor** …

3.2.4 Impact of the VCM curvature - error (STS-Beam A)

The fixed curvature the VCM on beam A is ROC = 200 mm instead of ~ 210 mm.
In this condition we have DC = 2.3809×10^{-4} mm^{-1}, which leads to:
DP_{out} = [DP_{out}/DC]×DC = -17538 m/(mm^{-1}). 2.3809×10^{-4} (mm^{-1}) = 4.18 m before the beam compressor, or **21 cm after the beam compressor.**

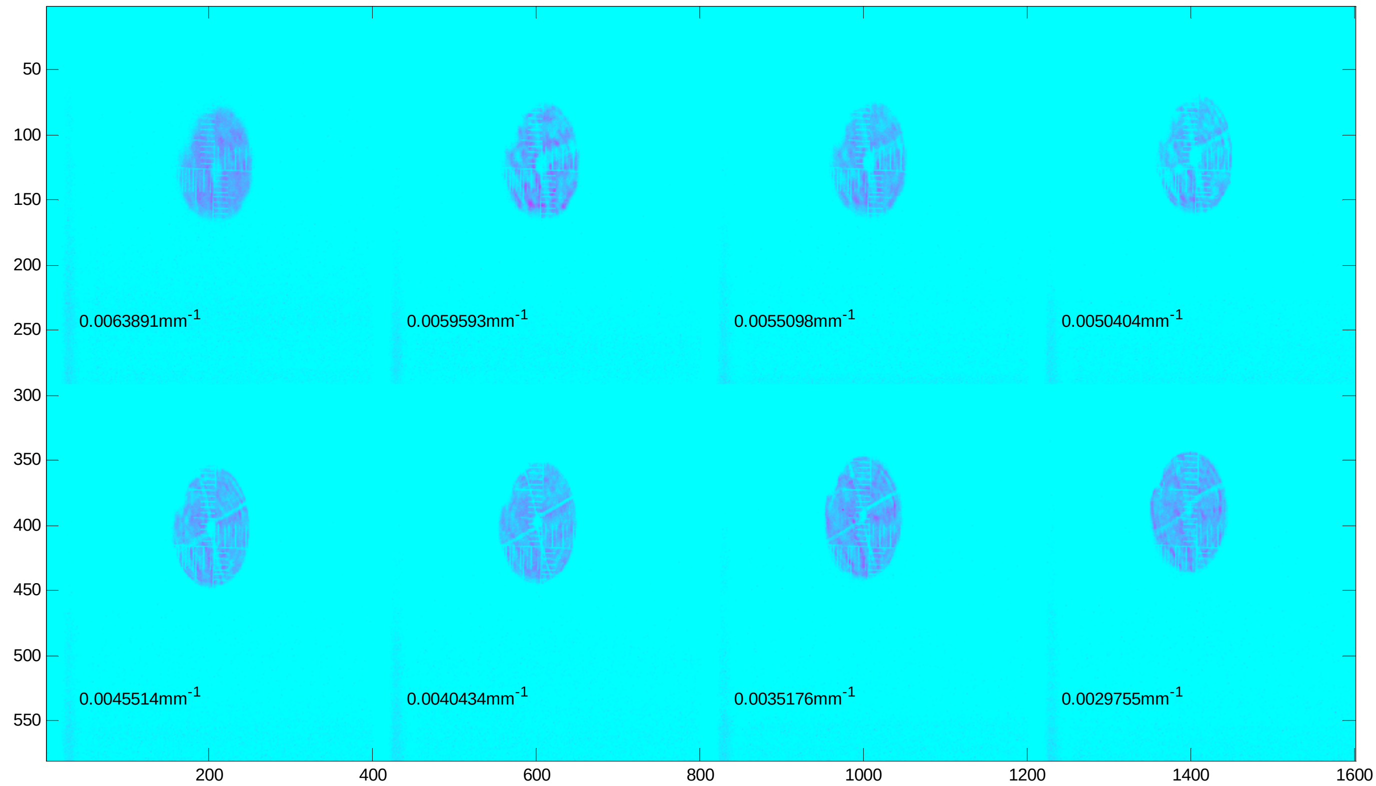
3.2.5 Pupil re-imaging test on stellar light

DL set at OPL = 17.772 m with the DL VCM set for UT4 ip4 and offset = 0:
- Pressure = 0.569 bar;
- Pin0 16.35 m;
- Pout0 27.566m.

(nominal operation on ARAL using a UT).

The pressure of the STS-VCM is scanned to optimize the pupil on Aral
The optimum pupil image is obtained experimentally by scanning the from STS-VCM= 4.4551×10^{-3} mm^{-1} to $3.35176e^{-3}mm^{-1}$ (AralStellarPupil.m)
The best ARAL image was obtained "*Visually*" for STS-VCM Pressure ~1.4 bar or Curvature ~ **3.3×10^{-3}** mm^{-1} which corresponds to a pupil out position Pout = 65.3 m.
The theoretical value of the STS-VCM is ROC = 210.83 mm, or Curvature = **4.743×10^{-3}** mm^{-1} which corresponds to a pupil out position of Pout = 90.5 m.

The difference between these two STS-VCM values correspond to a pupil longitudinal shift of P_{out} = 25 m before the beam compressor or **DP_{out}** = 25/(4.44^2) = **1.27 m after the beam compressor**. This is significant.



4 WEDNESDAY 22/10/2008

4.1 Characterization of the Fringe signals on Marcel

A ghost had appeared for new REF position of ACU: reason unknown.
Essentially the lateral displacement between ghost and useful signal is ~ 2-3 mm along the vertical direction as seen on the polarizer of the extraction block.
The fringe contrast is maximized using the tip/tilt of the injection block. The amplitude of the local fringes created by the ghost is decreased using the tip/tilt of the extraction lens.

4.1.1 PRIMET A on Marcel

Probe Fringe signal on Marcel:

- Contribution s (ip1): 194 mV
- Contribution p (ip3): 212 mV
- Fringe PV: 780 mV
- Fringe DC: 365 mV (V~1)

Ghost:

- Contribution s (ip1): 3 mV

- Contribution p (ip3): 3 mV
- Ghost fringes PV: 30 mv

Crosstalk
- Leakage of s in p: 10mV
- Leakage of p in s:13 mV
- Ghost Fringe leakage s in P: PV=48 mV
- Ghost Fringe leakage p in S: PV=48 mV

Reference fringes:
- PV=140mV
- Mean=57 mV (V~1)

4.1.2 PRIMET B on MARCEL

Probe fringe signal on MARCEL:
- Contribution s=115 mV
- Contribution p=162 mV
- Mean=265 mV
- PV=170 mV (V~32%) → Significantly **lower than PRIMET (TBC why)**

Ghost exits but is cut-off by the mirror we installed during AIV
Crosstalk
- Contribution s in P= 8,5 mV
- Contribution p in S= 1.5 mV
- Fringe leakage in P= noise level
- Fringe leakage in s=noise level

Reference fringes
- Mean=206 mV
- P-V=390 mV (V~94%)

4.2 Engineering files taken on Marcel on PRIMETA/B

lprma2PhaseMeter2008-10-22T19.36.22.txt
lprma2PhaseMeter2008-10-22T19.41.02.txt
lprma2PhaseMeter2008-10-22T19.42.30.txt
lprma2PhaseMeter2008-10-22T19.50.07.txt
lprma2PhaseMeter2008-10-22T19.54.21.txt

lprmacPhaseMeter2008-10-22T19.36.23.txt
lprmacPhaseMeter2008-10-22T19.41.03.txt
lprmacPhaseMeter2008-10-22T19.42.31.txt
lprmacPhaseMeter2008-10-22T19.50.07.txt
lprmacPhaseMeter2008-10-22T19.54.19.txt

see statistics in secton 8

4.3 Sighting scope test

A sighting scope is installed between the DDL and the Switchyard mirror to materialize ip2.
A red laser diode is retro-injected in the PRIMETB fibers (collimator of PRIMETB=achromat). The red beam is observed on the sighting scope .We verified that the sighting scope can be effectively used for PRIMET alignment provided that PRIMET uses achromats for beam collimation.

4.4 Straylight test on the STS-TCCD

The goal is to verify if the STS-TCCD can be used to check the alignment of the PRIMA metrology beam, by retro-injecting a red laser diode in the PRIMET fibers.
The VLTI axes are "defined" by the DL metrology straylight on the STS-TCCD
(note: the IR laser metrology (1.3 microns) beam cannot be sensed by the TCCD, because Silicon is not sensitive at this wavelength)

A red laser diode is connected to FSUB-Ip4 and propagates in the VLTI toward the STS-beam B.
We observe 2 spots on the STS-TCCD (with the FSM at their "edge" position of X=12.5;Y=12.5 as defined by Frederic Derie after the AT4-STS2 October mission):

PRIMA Metrology spots (using Red diode)

Spot 1
X=223.5
Y=157.5

Spot 2:
X=223.5
Y=5.5

DL Metrology spots are at:

Spot 1
X=220.5
Y=158.5

Spot 2:
X=219.6
Y=8

- ⇨ Conclusion: the STS-TCCD can be used to cross-check the alignment of the PRIMA metrology beams.

4.5 PRIMET_B fringes on AT#4-J2 and Marcel

Configuration:

PRIMET B : AT#4 STS2 beam B ip4 and MARCEL ip2
PRIMET A: MARCEL

STS-VCM and FSM at "nominal" positions given by Frederic Derie

Fsm Nom Beam A: (30.5 ; 30.5)

Fsm Nom Beam B: (12.5 ; 12.5)
VCM Nom Beam A: (19 ; 19) (default value because it could not be checked in the AT Hall: 19;19)
VCM Nom Beam B: (26.5 ; 10.5)

These values are recorded in the data base configuration file (.dbcfg).

First attempt to find fringes: FSM are "on edge".;

AT#4J2							
FSM				VCM			
Mirror 1=Beam A **NOT USED**		Mirror 2= Beam B IP4#-DL#4		Mirror 1=Beam A **NOT USED**		Mirror 2= Beam B IP4#-DL#4	
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=
U=0	*W=0*	U=	W=	*U=-*	*W=-*	U=	W=
				Pressure=Dummy		Pressure=1.7 bar 3.878e-3 mm^{-1} (Optimum found in August)	
DL#4							
Position OPL		14m					
VCM pressure		0					

Fringes detected immediately and recorded on lprmac and lprma2. File names are:

- XX23T00.08 (lprmac & lprma2);
- XX23T00.10 (lprmac & lprma2).

The files are acquired at a sampling frequency of 500 Hz over 1 minute with the enclosure closed.

The DC level of the probe signal 450 kHz is measured to be: ~ 200 mV.

Second attempt to find fringes: Same configuration as during AIV (August 2008)
Optimum values found in August 2008

- **STS-VCM Beam B=1.7 bar**
- **DL#4 VCM=1.3 Bar (for OPL=14m)**

When setting the DL#4 VCM pressure to 1.3 bars the beam is lost.

Offsets are added to the FSM and to the VCM position:

- *On the FSM*: to remove the metrology spot from the M10 edge, the absolute position is then: (12.5 ; 11.5) (nominal pos + U alignment offset = 50);
- *On the VCM*: to recenter the spot, the absolute position is then (29.5 ; 5) (nominal position + alignment offset U=3 W=-5.5).

AT#4-J2							
FSM				VCM			
Mirror 1=Beam A **NOT USED**		Mirror 2= Beam B IP4#-DL#4		Mirror 1=Beam A **NOT USED**		Mirror 2= Beam B IP4#-DL#4	
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=
U=0	*W=0*	U=50	W=	*U=-*	*W=-*	U=3	W=5.5
				Pressure=Dummy		Pressure=1.7 bar 3.878e-3 mm^{-1} (optimum found in August)	

DL#4	
Position OPL	14m
VCM pressure	1.3 Bar (optimum found in August)

Files are recorded on lprmac and lprma2 with the file names:

- XX23T00.29 (lprmac & lprma2);
- XX23T00.34 (lprmac & lprma2).

We change the DL VCM pressure to 0.569bar
(This corresponds to the theoretical pressure without 4 m offset: ~ 3.71×10^{-4} mm^{-1} for DL at 17 m OPL)
We optimize the VCM position but we get less flux….

We come back to previous configuration: DL#4 at 1.3 bar STS-VCM at 1.7 bar with appropriate FSM/VCM position.
Measurement files are taken with the following names and configuration:

- XX23T00.50 (lprmac & lprma2), enclosure closed;
- XX23T00.54 (lprmac & lprma2), 5 min at 500 Hz enclosure opened;
- XX23T00.59 (lprmac & lprma2), 5 min at 500 Hz enclosure opened;
- XX23T01.05 (lprmac & lprma2), 5 min at 500 Hz enclosure opened.

During the measurement the atmospheric conditions were:

- seeing 0.7;
- wind speed 7m/s.

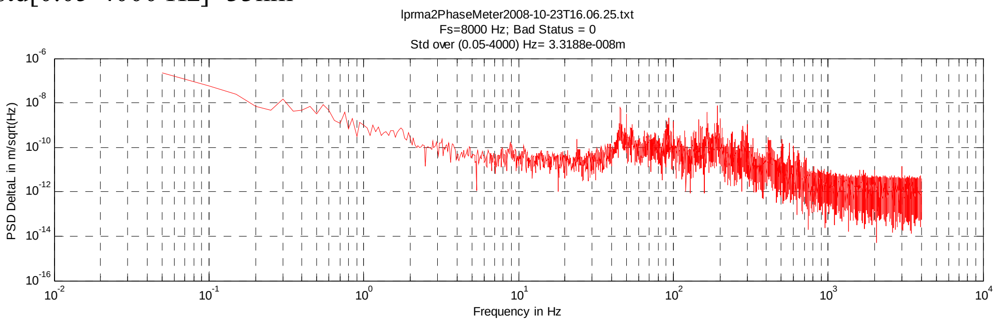
5 THURSDAY 23/10/2008

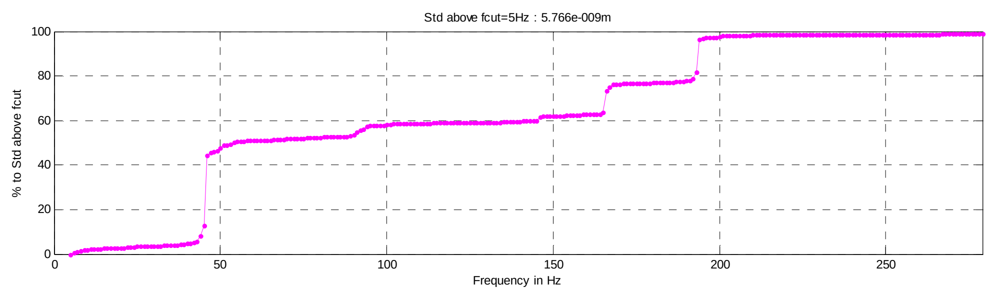
5.1 Vibration analysis with MIDI closed cycle cooler ON/OFF

16 seconds files are taken with a sampling frequency of 8kHz.
Measurement of OPD before/after switching on the closed cycle cooler.

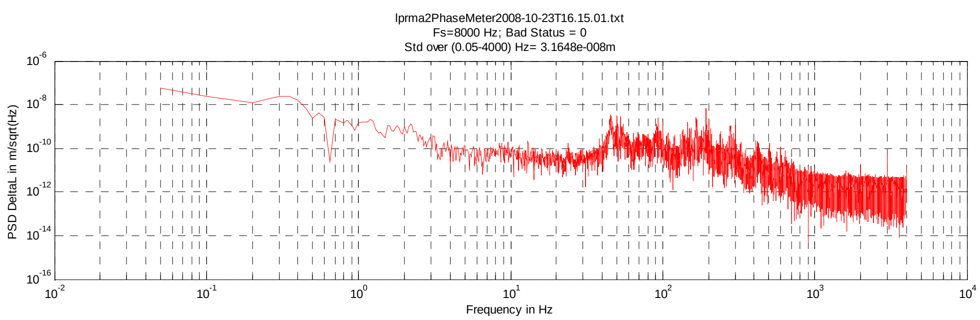
- No significant difference.

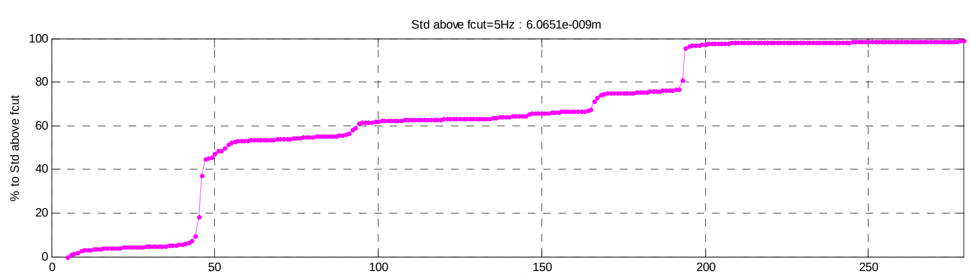
Before: std[0.05-4000 Hz]=33nm





After: std[0.05-4000 Hz]=31nm





5.2 Beam propagation through AT#4 STS-Beam A

M16 in position to 2UT to launch Beam A of STS#4 in Ip2
Beam A Fixed VCM with ROC=200mm   curvature=5×10^{-3} mm^{-1}
DL#4 at 14 m with theoretical curvature:

ComputeVCMParametersATBC('UT4',4,2,7,4.5,-1)->3.798890×10^{-3} mm^{-1}

Failed…..
Nothing is coming back from Beam A
See diagnostic in section 6.1

5.3 Pupil re-imaging and pupil tracking test on STS beam B

Configuration:
M16 in position to 4AT to launch Beam B of STS#4 in Ip4.
DL#4 at 14 m
DL#4 VCM set to theoretical curvature (with Pupil longitudinal offset of 4.5 m in the lab to reach the PRIMA table)

ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1)-> 4×10^{-3} mm^{-1}

We start with the "nominal" parameters

AT#4-J2							
FSM				VCM			
		Mirror 2= Beam B IP4#-DL#4				Mirror 2= Beam B IP4#-DL#4	
		Xedge=12.5	Yedge=12.5			Xcenter=26.5	Ycenter=10.5
		X=	Y=			X=	Y=
		U=50	W=			U=0	W=0
						1.4 bar or ~ 3.3×10^{-3} mm^{-1} (optimized value using ARAL see section3.2.5).[4]	
DL#4							
Position OPL	14m						
VCM pressure	ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1)-> 4e-003 mm-1						

Then the STS-VCM pressure is scanned from 1 bar to 2 bars. We observe visually the retro-reflected spot **at the level of the K prism** (i.e ~0.55m before the target pupil plane located on the FSU_BC)
At P = 1 bar the spot is "focussed" closed to the IRIS FO. Increasing P moves the "focus" towards the FSU.
The optimum pressure is ~ 1.6 bar.
After this the retro-reflected beam is adjusted laterally to optimize the flux coupled into the metrology fiber (U = 2 W = -7).

[4] The relation curvature- pressure must be taken from Figure 3 !! AT#4-VCM calibration parameters were taken from an old DL#1 calibration

Then we adjust the position of the quadcell to center the spot on it.

Optimum configuration:

AT#4-J2							
FSM				VCM			
		Mirror 2= Beam B IP4#-DL#4				Mirror 2= Beam B IP4#-DL#4	
		Xedge=12.5	Yedge=12.5			Xcenter=26.5	Ycenter=10.5
		X=	Y=			X=	Y=
		U=50	W=			U=2	W=-7
						1.6 bar (C= 3.725 mm^{-1} based on Figure 3)	
DL#4							
Position OPL	14m						
VCM pressure	ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1)-> 4e-003 mm-1						

We record some open loop files with the quadcell on ip4:
1kHz during 100sec.
Problem with the time stamp in the file….
File names:
XXXT00.54 to XXXT01.22.
Last 3 files have the correct time stamp (but only ~10 sec long): to be checked by R.Frahm

We then tried to send corrections:
offsets are too large with gain =2, the guiding stops automatically.
Further pupil tracking test are reported in section 6.4 and 7.

6 FRIDAY 24/10/2008

6.1 Checking the origin of the transmission problem on beam A

The **pupil beacon** is observed through Beam A on ARAL.
It is centred for a STS-VCM position of (U = 8 ; W = -8),
(STS-FSM positions (30.5 ; 32.5)).
The STS-VCM has a fixed curvature

The theoretical pressure to be applied to the DL4 VCM to image properly the beacon is obtain with the Matlab function:
ComputeVCMParametersATBC('UT4',4,3,7,0,-1)= 5.728355×10^{-4} mm^{-1} (P = 0.2 bar).
However its seems better with a pressure P = 1.5 bars (curvature = 3.48×10^{-3} mm^{-1}).

- Factor 6 on the curvature !

We set M16 on 2UT to observe AT#4 Beam A on ip2

Image beacon observed on AT TCCD.
M6 is set to the positions given by Frederic Derie in his log: Tilt M6 = (4.7 ; 1.4) for a derotator at zero
We move the derotator from 0 deg to 180 deg from the panel (=360 deg in reality).
The run-out of the beacon is significant.
Then we adjust the tilt of M6 to minimize the run–out on the TCCD
New M6 tilt values are: (-0.6 ; 0.8).

Due to lack of time, we do not attempt observing the image beacon on IRIS.

From the delay line tunnel we make the following observations:

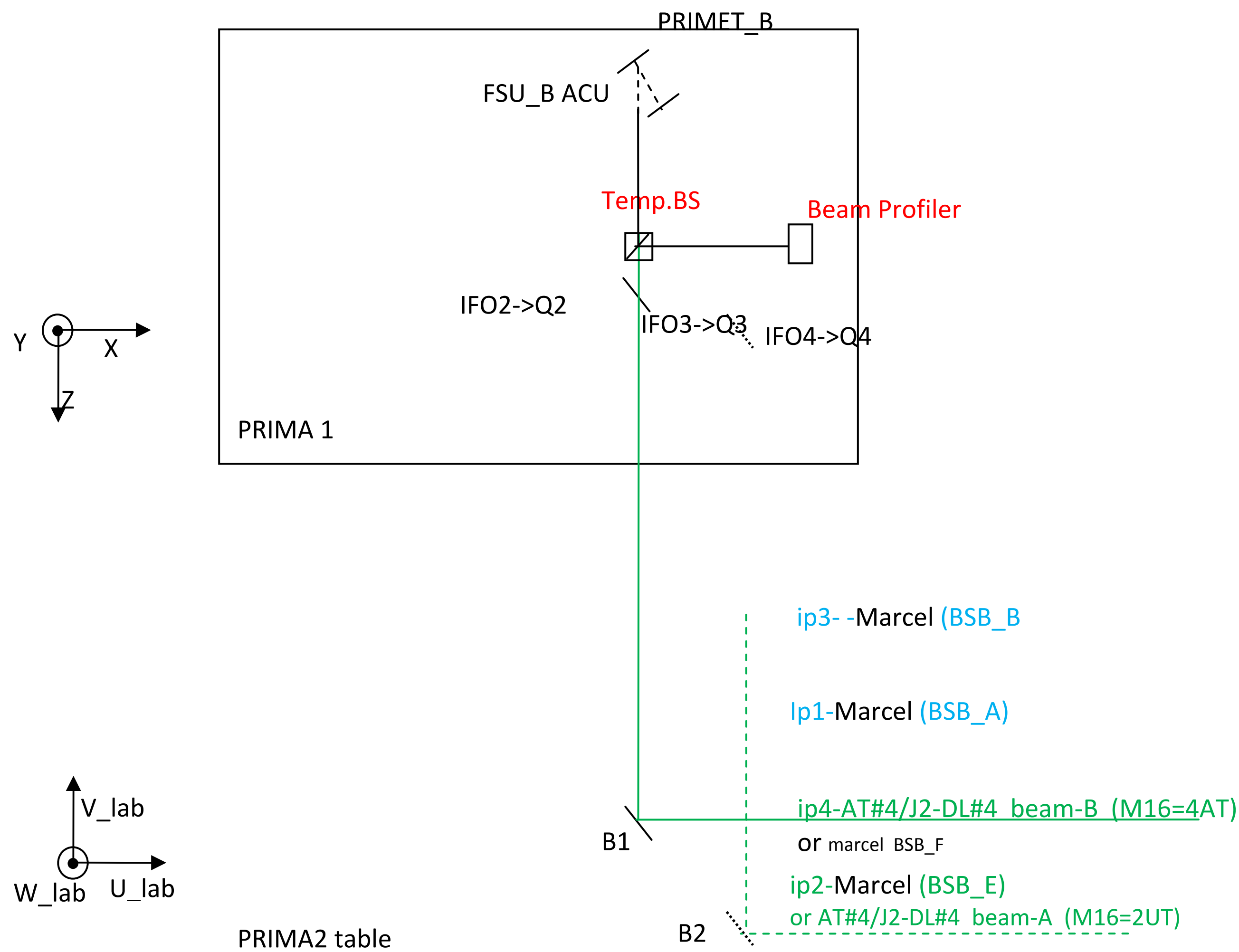
- The straylight of the DL metrology of DL#4 is visible from the entrance of the J2 light duct (looking towards the STS. It is well centered for Beam B, but completely offseted for Beam A
- We retro inject a red laser diode in the metrology fibers (ip2) to materialize the metrology beam going to the AT-STS. It is well centered at the level of the entrance of the J2 light duct. It is partially retro-reflected but completely offseted and the position cannot be modified significantly by applying tilt offsets to the STS-VCM.

CONCLUSION:

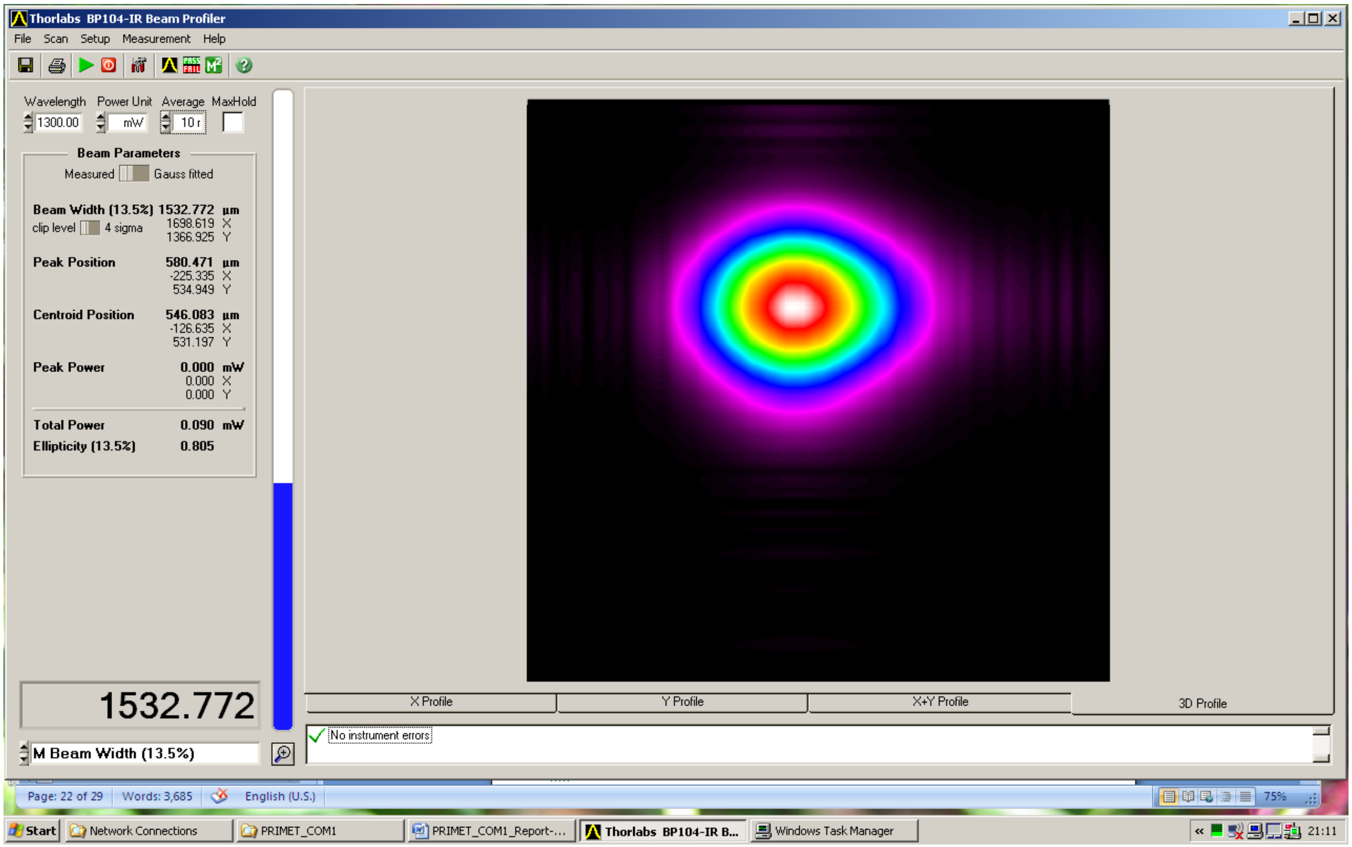
- The optical train inside STS-Beam A is not aligned, most probably because of the STS-VCM. To be checked on G2.
- Until a procedure is elaborated to check the STS-outputs after installation on a given station, we suggest to systematically install an STS an G2, check the beam propagation, and then move the STS to the required station.

6.2 Optimization of the STS-VCM curvature on beam B using the beam profiler

A 50/50 BS and a beam profiler are installed between the FSU ACU and IFO3 to monitor the shape of the retro-reflected beam. The position of the Beam profiler corresponds to an observing plane ~intersecting the V coordinate of the active ACU Mirror. This plane is about 1.13m (TBC) from the target position of the pupil plane located on the FSU_BC.



The STS-VCM pressure is optimized by observing the retro-reflected spot on the beam –profiler.
The DL#4 VCM Curvature is set to its theoretical value for OPL=**14m**, i.e.Curv=4×10^{-3} mm^{-1} (P = 1.7598 bar)



The combination of optimum ellipticity (**ε=0.8**) and minimum beam diameter (**d=1532 microns**) is found for:
AT4-STS VCM Beam B Curvature = **4.011×10^{-3}**
This curvature is equivalent to P = 1.75 bars as seen on the Gui

(However, we notice from the data plotted in Figure 3 for STS-AT#4
That P=**1.75** bar-> 4.043 e-3 mm-1 (Pout=78.25)
P=1.735-> **4.011e-3** mm-1 (Pout=77.7m)
ΔPout=0.55m

- ➔ Is that link to a computation problem depending if a pressure or a curvature is requested ?

Check of the scaling [VCM alignment offset/beam displacement in the lab]
Centroid_beam profiler = (-90 ; 400) microns
Then we apply an alignment offset on STS-VCM of W=1 micron
Centroid _beam profiler= (-260 ; 500) microns

dR/dW=sqrt((90-260)^2+400-500)^2)/1~200microns per micron of alignment offset.

This is significantly smaller than:

- the theoretical value of: ~ 1.37 mm/micron piezo
- the value measured during the May2008 test (AT#4-STS on G2 instead of J2) : 1.2 mm/micron piezo

To be investigated

Note: the direction of displacement on the beam profiler does not necessarily correspond to the direction of displacement on the quadcell because the beam profiler and the quadcell do not have necessarily the same orientation.

6.3 Conclusion on Pupil re-imaging.

Table 1 summarizes the experimental STS-VCM pressure found to re-image the pupil in the VLTI lab. The STS-VCM has to re-image the pupil correctly from J2 to the middle of the tunnel (for DL#4). The re-imaging of the pupil by DL#4 is assumed to work according to theory (see 3.2.2).
Considering that the uncertainty on the pressure-curvature calibration for STS#4-VCM can potentially lead to longitudinal pupil offsets of more than 1 m in the laboratory (see 3.2.3), the results obtained for the metrology beam are somehow consistent.
Nevertheless, it is necessary to perform further tests with the appropriate pressure-curvature law.

It seems that optimizing the STS-VCM pressure using ARAL is not precise enough.
Finally one has to check if longitudinal pupil offsets of more than 1 m are acceptable during FSU operation.

Configuration : AT#4-J2-BeamB DL#4	AT#4 VCM B Curvature	Longitudinal position of the AT output pupil plane from the center of the J2 station (P_out)	Pupil longitudinal position error w.r.t theoretical position, before and after the Beam Compressor
Theoretical STS VCM curvature (see section3.2.1)	**4.743e^{-3} mm^{-1}**	90.5 m	0m/0m
Test on Stellar light-ARAL (see section 3.2.5)	**3.3 e^{-3} mm^{-1} (precision TBC)**	65.3 m	-25.2m/-1.28m
Visual Optimization D=**0.55m** before the target pupil plane (FSU_BC) (see section 5.3)	**3.725 e^{-3} mm^{-1}**	72.75 m	-17.75m/-0.9m
Optimization on the beam profiler D=**1.13 m(TBC)** away from the target pupil plane (FSU_BC) (see section 6.2)	**4.011 e^{-3} mm^{-1} (4.043 e^{-3} mm^{-1})**	77.7 m (78.25m)	-12.8m/-0.65m (-12.25/-0.62m)

Table 1: Summary of optimum AT#4-STS-J2 VCM pressure , for DL#4. (DL#4 at OPL=14m)

6.4 Pupil Tracking test on AT#4-J2/beam B

6.4.1 Configuration

- M16 in position 4AT to observe beam B on IP#4
- DL4 :

    OPL= 14 m

    VCM: ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1)-> 4×10^{-3} mm^{-1} P = 1.7598 bar.
- AT4-STS2 Beam B Curvature = 4.011×10^{-3}, P = 1.75 bars (optimization on beam profiler)

Optimization of the VCM position by optimizing the flux injected at the fiber extraction: VCM (2.1 ; -7.5)
Optimization of the VCM position on the quadcell (include alignment error of quadcell): (U=1.9;W= -7.2)

- **This indicates that the quadcell center and the extraction fiber are not well co-aligned**.

If the laser is at full power, and the AOM at 100%, the quadcell saturates even if the gain is at 1 !!
So we use:

- Plaser = 150 mW (Set) = ~160 mW (measured on GUI)
- AOM ip4 = 20 % (all other AOMs remain at 100 %)

This may affect the simultaneous operation of the fringe detection and of the pupil tracking. The possible solutions are:

- Confirm if the fringe detection can operate with only Plaser=150 mW . This is anyway not safe because it will affect the robustness of PRIMET.
- Change the BS of the extraction block with a different splitting ratio. We currently have 30/70, with 30% for the quadcell. The necessary attenuation is 150mW/300mWx20%=0.1. The splitting ratio should be 3/97 !...However, this requires ungluing the current BS…
- Insert additional density filters in front of the quadcell (or linear polarizors). This is the easiest solution to start with. We need to check that a similar problem occurs for the other quadcell (s polarization)

Final configuration:

<table>
<tr><th colspan="8">AT#4-J2</th></tr>
<tr><td colspan="4">FSM</td><td colspan="4">VCM</td></tr>
<tr><td colspan="2"></td><td colspan="2">Mirror 2= Beam B
IP4#-DL#4</td><td colspan="2"></td><td colspan="2">Mirror 2= Beam B
IP4#-DL#4</td></tr>
<tr><td></td><td></td><td>Xedge=12.5</td><td>Yedge=12.5</td><td></td><td></td><td>Xcenter=26.5</td><td>Ycenter=10.5</td></tr>
<tr><td></td><td></td><td>X=</td><td>Y=</td><td></td><td></td><td>X=</td><td>Y=</td></tr>
<tr><td></td><td></td><td>U=50</td><td>W=</td><td></td><td></td><td>U=1.9</td><td>W=-7.2</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">1.75 bar (optimization on the beam profiler)</td></tr>
<tr><th colspan="8">DL#4</th></tr>
<tr><td colspan="2">Position OPL</td><td colspan="6">14m</td></tr>
<tr><td colspan="2">VCM pressure</td><td colspan="6">ComputeVCMParametersATBC('UT4',4,4,7,4.5,-1)-> 4e-003 mm-1</td></tr>
</table>

6.4.2 Open-loop data

We record open loop measurement on the quadcell (Ip4 only) with the enclosure closed , over Tobs=100 sec and a 1 kHz sampling frequency.

See additional open loop data in section 7.3

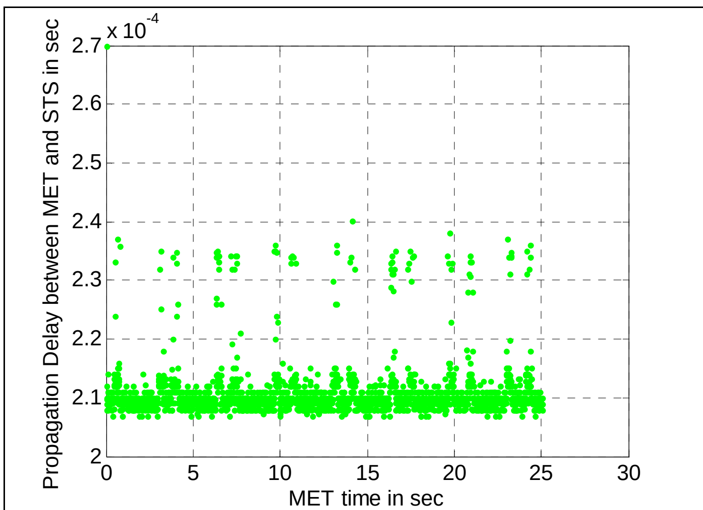
Filename	Loop	Enclosure	Wind	Beam radius	Pk.R	Rms R	Tobs
24T19.53	Opened	Closed	-	≥0.75mm	0.295	0.055	100s
24T19.56	Opened	Closed	-	≥0.75mm	0.333	0.053	100s
24T20.00	Opened	Closed	-	≥0.75mm	0.284	0.048	100s
24T20.05	Opened	Closed	-	≥0.75mm	0.300	0.044	100s
24T20.13	Opened	Closed	-	≥0.75mm	0.267	0.046	100s

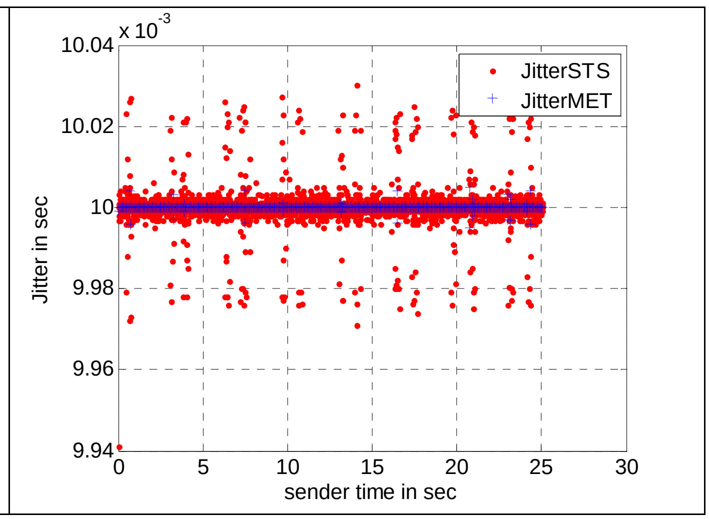
These data may suffer from a bias due to the vignetting effect identified in section 6.4.4

- The measured displacements along -Y are larger than in reality
- The measured displacements along +X are smaller than in reality

6.4.3 Measurement of the delay and jitter of the correction data on the dedicated LAN

The loop is closed with an extremely small gain, (large enough to send non zero corrections but small enough to remain within corrections threshold) during the measurement time.
The corrections are sent with a sampling of 100Hz.
We measure the propagation delay and jitter of the correction data as reported in the following figures.
The results are as good as in May2008. No Problem.



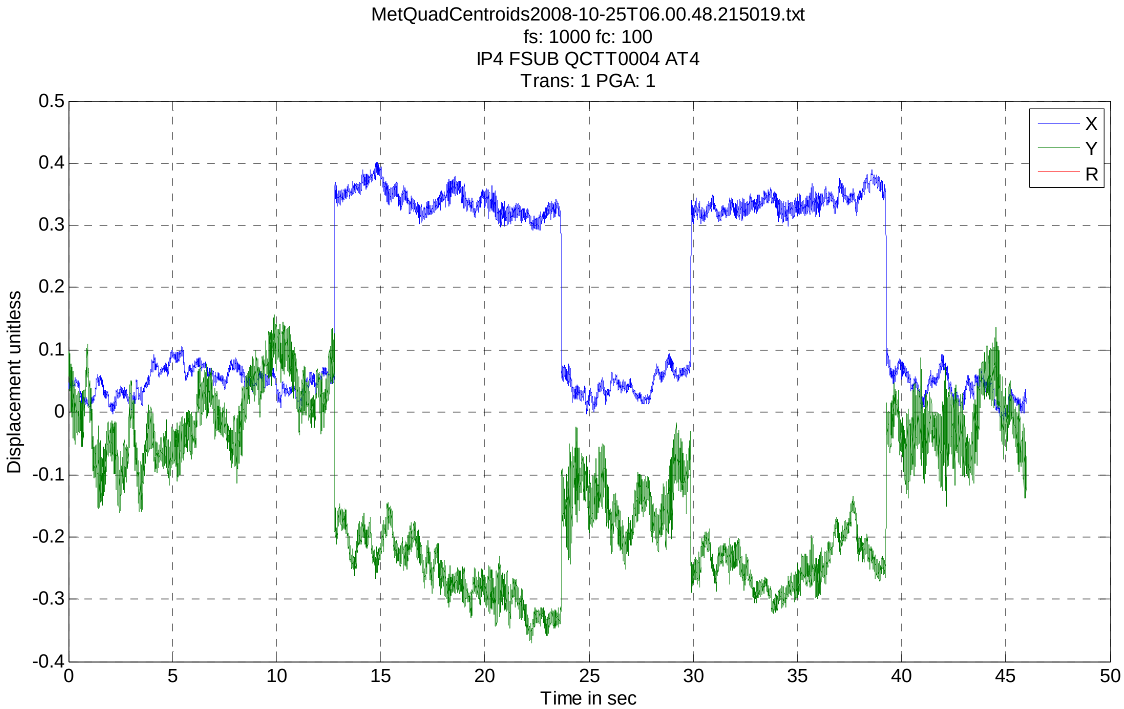


6.4.4 Closed loop pupil tracking

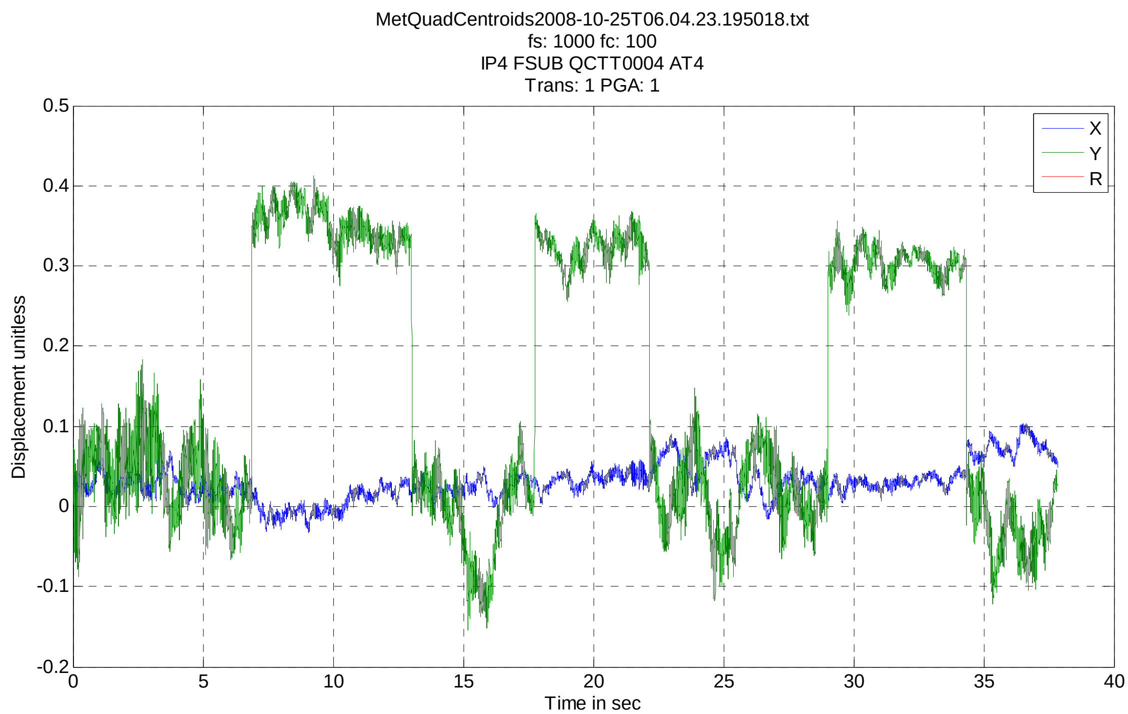
Close loop on ip4

24T20.50: G=0.02 , with kick ~ 1 in U and W from pspzgui
T01.12: G=-0.01
T01.15 : G=0.01 a11=1 a12=0 a21=0 a22=-1
T01.23:G=0.01 a11=-1 a12=0 a21=0 a22=-1
T01.28 G=0.01 a11=1 a12=0 a21=0 a22=1

Check Interaction Matrix



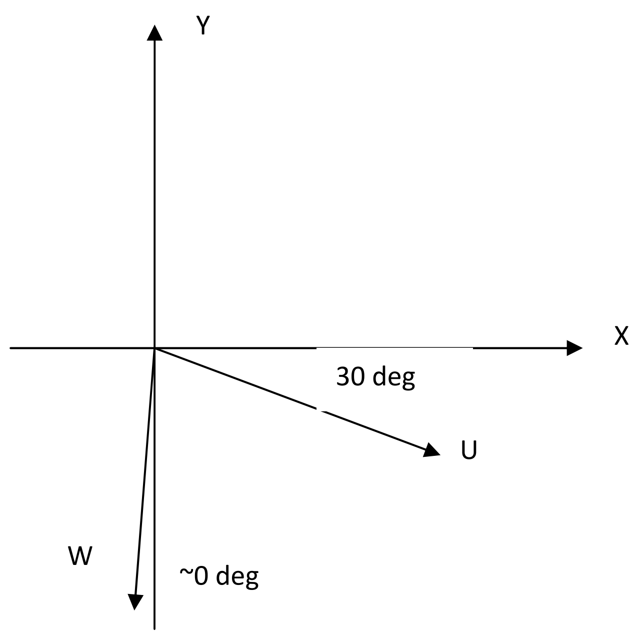
U=1.9 to U=2.4 and back several times (deltaU=+0.5) → deltaX=+0.25 deltaY=-0.15
W=-8 deltaW=0
Theta=atan(0.15/0.25)=30deg !!



W=-8 to W=-8.5 and back several times (deltaW=-0.5)→ deltaY=+0.3 and deltaX~0 !!
U=1.9 deltaU=0

➔ Almost no motion along X !!

The "measured" interaction matrix can be represented as sketched below:



Something is obviously wrong…

The loop cannot be closed on both axes simultaneously , but only on the Y axis.

This situation could be explained by the mask that had to be introduced to remove the ghost generated in the FSU_BC. If the edge of the mask is too close to the returned beam, a motion along X will be interpreted as a motion along X and –Y as the apparent flux goes down. A pure motion along Y will be less affected by the mask with the orientation sketched in Figure 5.

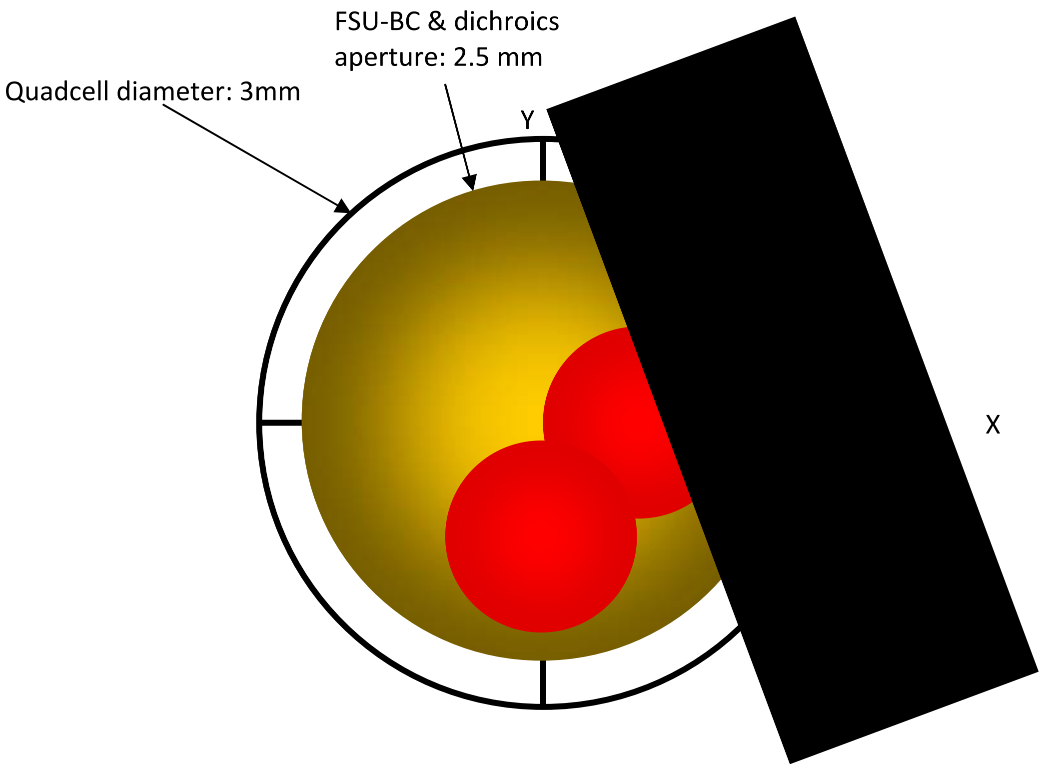
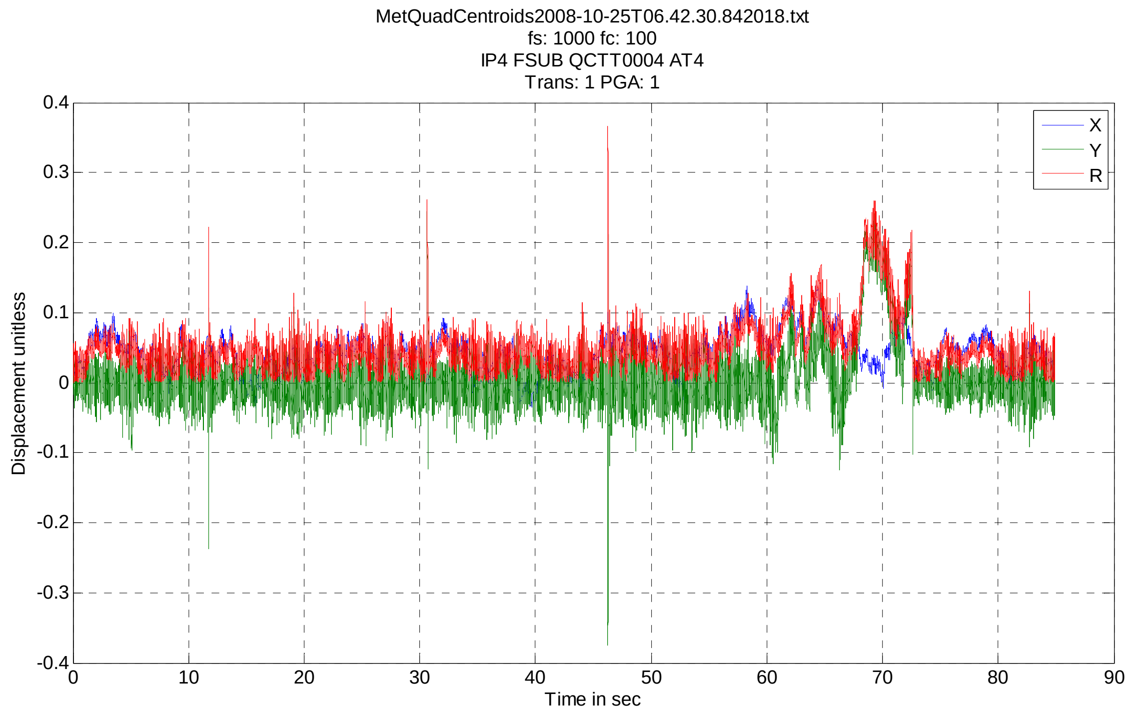


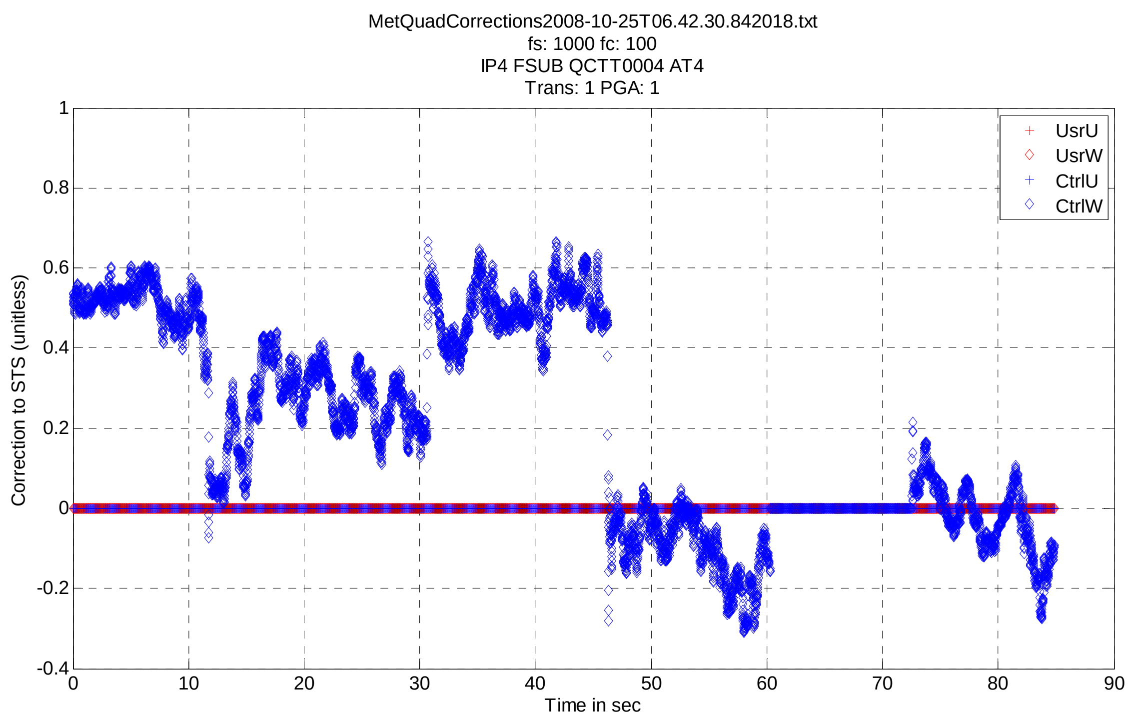
Figure 5: Orientation of the mask w.r.t the quadcell.

Try to guide only on Y:
Dbcfg:
Gain=0.06
A11=0 A12=0 A21=0 A22=-1: This does not work

Gain=0.06
A11=0 A12=0 A21=0 A22=1 This Works
File T06.42

Problem with sudden saturation at 9V of all quad although STS is in same position
Just after playing with AOM and controlling on Y axis (only)





3 kicks are correctly compensated the controller.
Open loop between 55 and 75 sec then closed loop again

7 SATURDAY 25/10/2008

7.1 Engineering files taken on Marcel on PRIMETA/B

lprmacPhaseMeter2008-10-25T14.27.27.txt
lprmacPhaseMeter2008-10-25T14.28.16.txt
lprmacPhaseMeter2008-10-25T14.29.17.txt
lprmacPhaseMeter2008-10-25T14.36.20.txt
lprmacPhaseMeter2008-10-25T14.47.05.txt
lprmacPhaseMeter2008-10-25T14.54.35.txt
lprmacPhaseMeter2008-10-25T15.00.05.txt

lprma2PhaseMeter2008-10-25T14.27.31.txt
lprma2PhaseMeter2008-10-25T14.28.15.txt
lprma2PhaseMeter2008-10-25T14.29.19.txt
lprma2PhaseMeter2008-10-25T14.36.19.txt
lprma2PhaseMeter2008-10-25T14.47.07.txt
lprma2PhaseMeter2008-10-25T14.54.34.txt
lprma2PhaseMeter2008-10-25T15.00.03.txt

The results are shown in section 8

7.2 Alignment of an additional quadcell for independent pupil tracking test

In order to check the origin of the interaction matrix problem described in 6.4.4, a new quadcell has been installed on the PRIMA2 table as shown in Figure 6. The returned metrology beam bypasses the FSU optics and PRIMET extraction optics. This configuration is similar to the one used during the pupil tracking test of May2008.

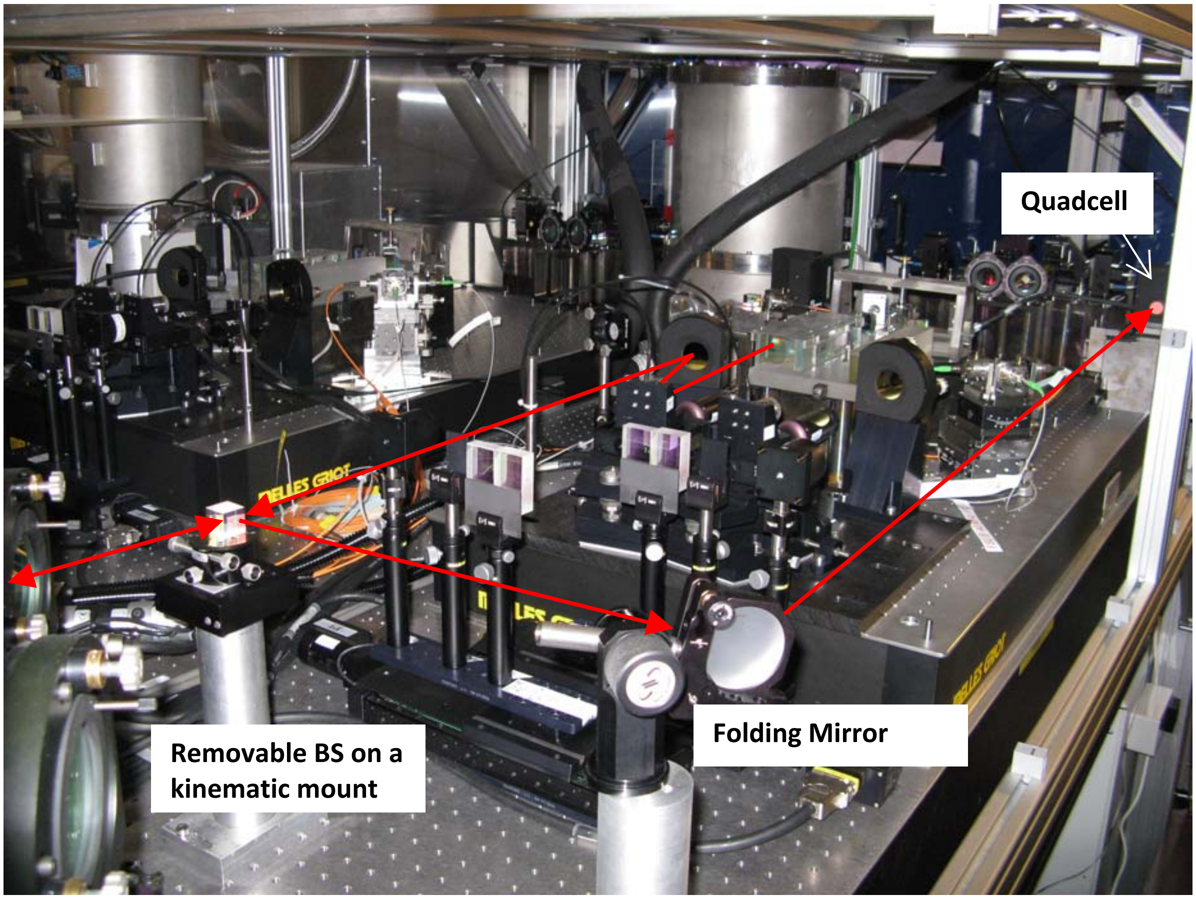


Figure 6: Set-up for pupil tracking test independent of the FSU BC path

7.3 Pupil tracking test on AT#4-J2 beam B, with an independent quadcell

The configuration used is:

- AT4-STS2 in J2, Beam B; STS-VCM Curvature ? **as in section 6.2 ??4.011 e^{-3} mm^{-1}??? Beam diameter ->1532 microns?? But the beam diameter was measured at another location.Here it is likely that the beam diameter was larger ??**
- DL4 (Curvature = 4×10^{-3} mm^{-1});
- M16 in 4AT;
- BC;
- FSUB;
- IP4.

The interaction matrix is:

a_{11} = -1, a_{12} = 0, a_{21} = 0 and a_{22} = 1.

Pupil tracking was achieved using the same interaction matrix and parameters as in May2008.
This demonstrates that the origin of the interaction matrix problem is in the path of the FSU BC and PRIMET extraction optics, with a strong indication that it comes from the mask inserted in the PRIMET extraction optics.

The results are summarized in Table 2, as well as in Figure 7and Figure 8. Closed loop residuals are within specs. However it should be noted that significant disturbances were only observed on 1 file (25T22.49). This is in contradiction with the open loop data shown in section 6.4.2 (all Pk R~ 0.3).

Two types of controllers were used:
1/ PI Controller:
gain = 0.03;
$a_1 = a_2 = b_2 = 0$; $b_1 = -1$;
interaction matrix is $a_{11} = -1$, $a_{12} = 0$, $a_{21} = 0$ and $a_{22} = 1$.
2/ Phase Compensated controller proposed by D.DiLieto
a1 = -1.890385; a2 = -1.999057; b1 = 0.89215; b2 = 0.999057
interaction

The phase compensated controller has a better rejection of the low frequency disturbances. However since the residuals are dominated by eigen frequencies in the 50-100Hz region, i.e. far above the ~ 1Hz close loop bandwith, both controllers provides the same closed loop residuals.

Filename	Loop	Enclosure	Wind	Beam radius (TBC)	Pk.R[5]	Rms R	Tobs	Controller
25T22.26	Closed	Closed	-	~0.75mm	0.058	0.007	300s	PI
25T22.36	Closed	Closed	-	~0.75mm	0.087	0.009	300s	PI
25T22.49	Opened	Closed	-	~0.75mm	0.739	0.171	300s	-
26T02.28	Opened	Opened (3AT)	12m/s	~0.75mm	0.109	0.022	300s	-
26T02.34	Opened	Opened (3AT)	12m/s	~0.75mm	0.122	0.020	300s	-
26T02.45	Closed	Opened (3AT)	12m/s	~0.75mm	0.102	0.010	300s	PI
26T02.53	Closed	Opened (3AT)	12m/s	~0.75mm	0.092	0.010	300s	PI
26T03.04	Closed	Opened (3AT)	12m/s	~0.75mm	0.082	0.011	300s	Phase Comp.
26T03.10	Closed	Opened (3AT)	12m/s	~0.75mm	0.088	0.013	300s	Phase Comp.
26T03.18	Closed	Opened (3AT)	12m/s	~0.75mm	0.066	0.009	300s	Phase Comp.
26T03.25	Opened	Opened (3AT)	14m/s	~0.75mm	0.163	0.026	300s	-
26T03.32	Opened	Opened (3AT)	14m/s	~0.75mm	0.126	0.020	300s	-
26T03.39	Opened	Opened (3AT)	15m/s	~0.75mm	0.116	0.016	300s	-
26T03.46	Closed	Opened (3AT)	15m/s	~0.75mm	0.109	0.012	300s	Phase Comp.

Table 2: Pupil tracking measurement summary (25-26/10/2008)

[5] Radial displacement with respect to the first point of the data set

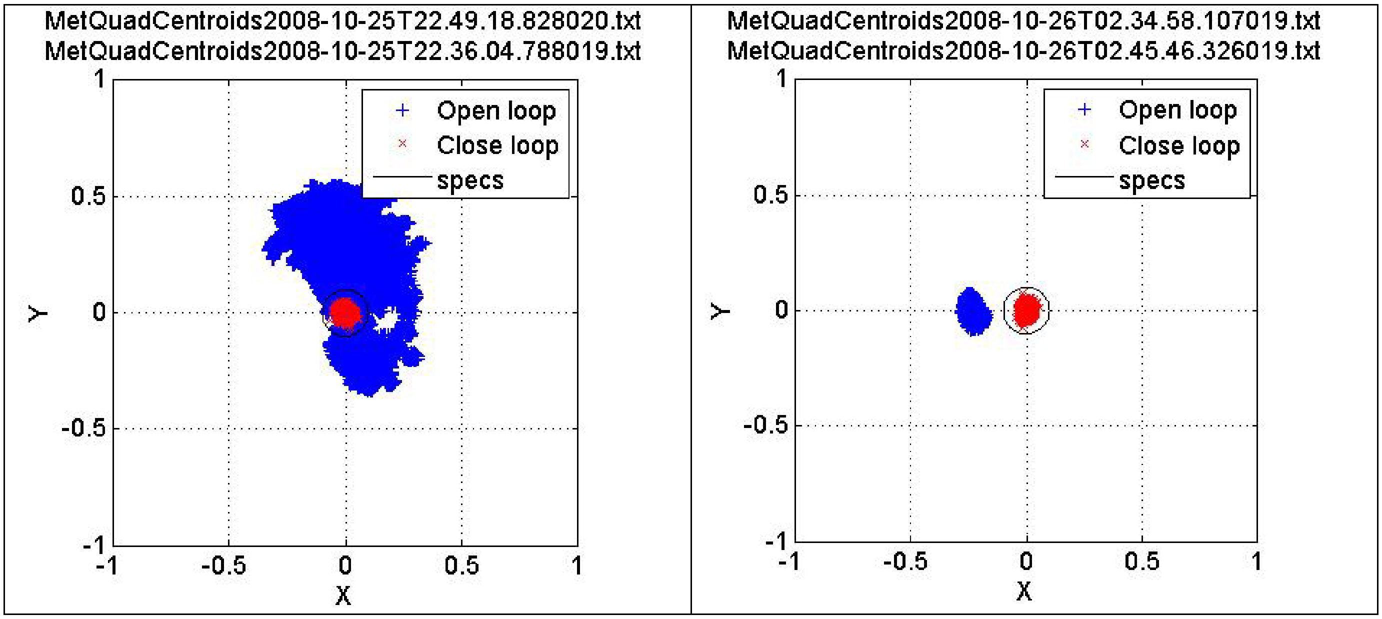


Figure 7: Comparison of the open loop and closed loop residuals

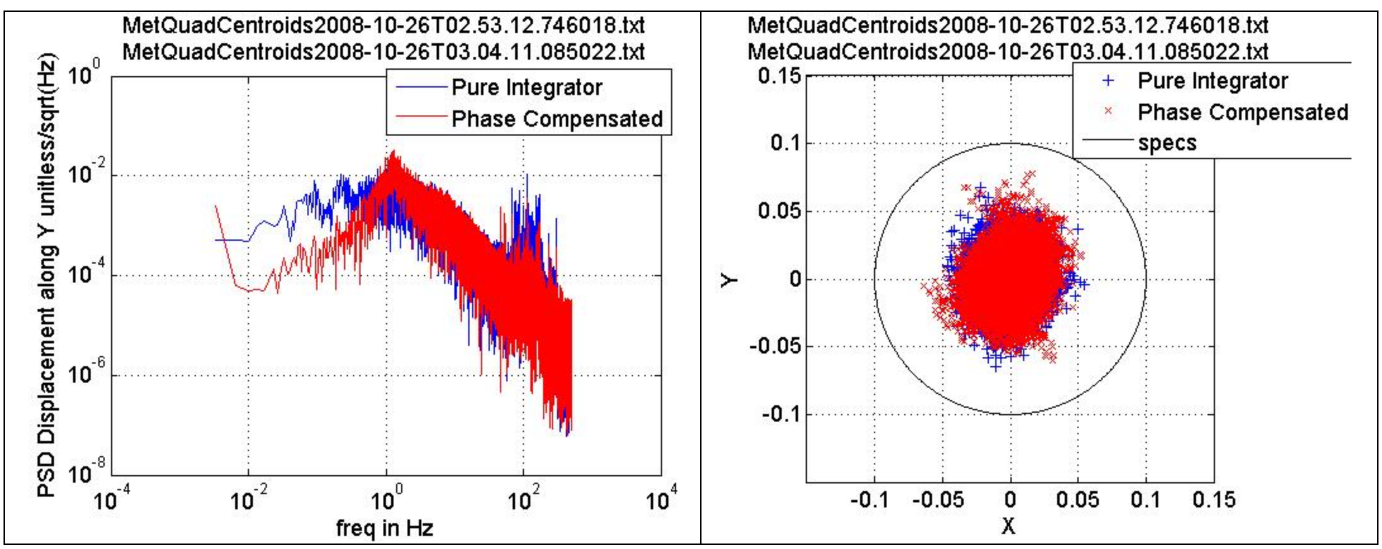
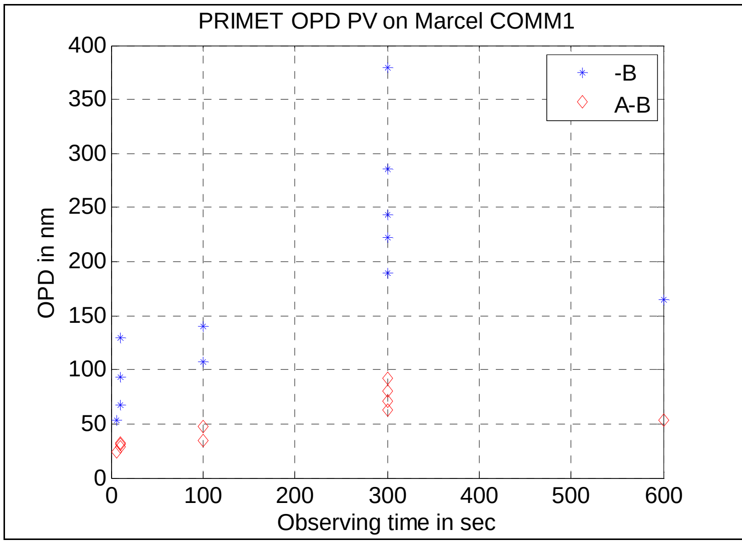
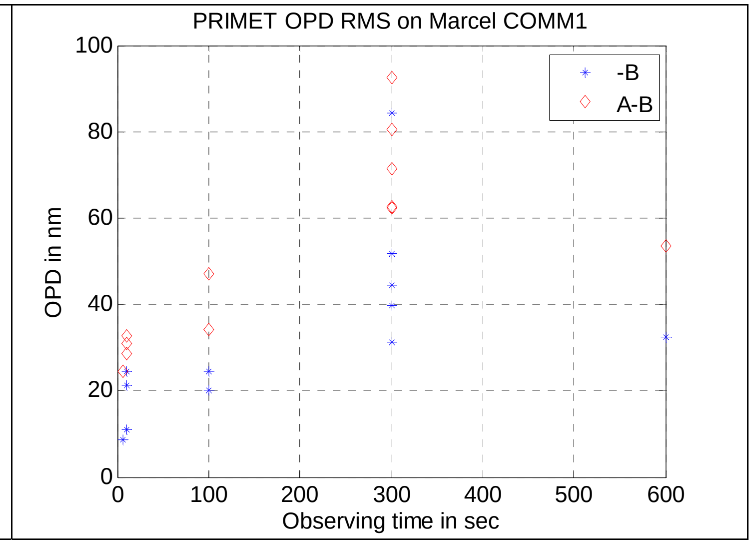
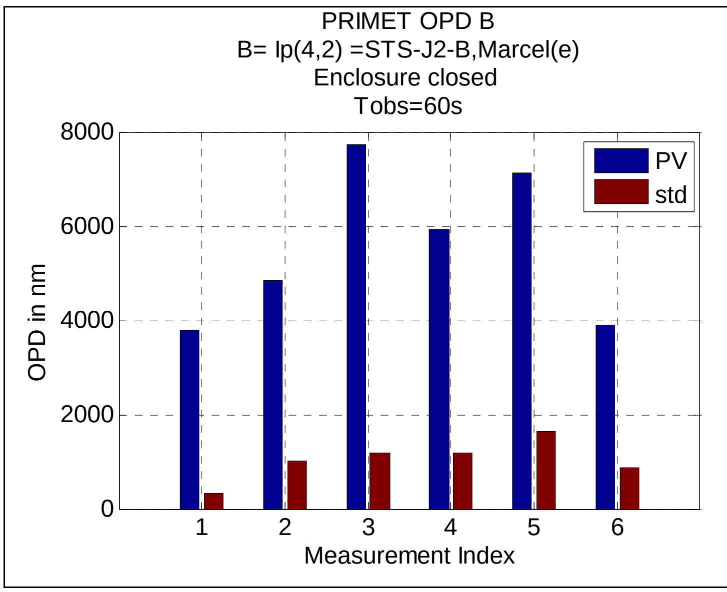


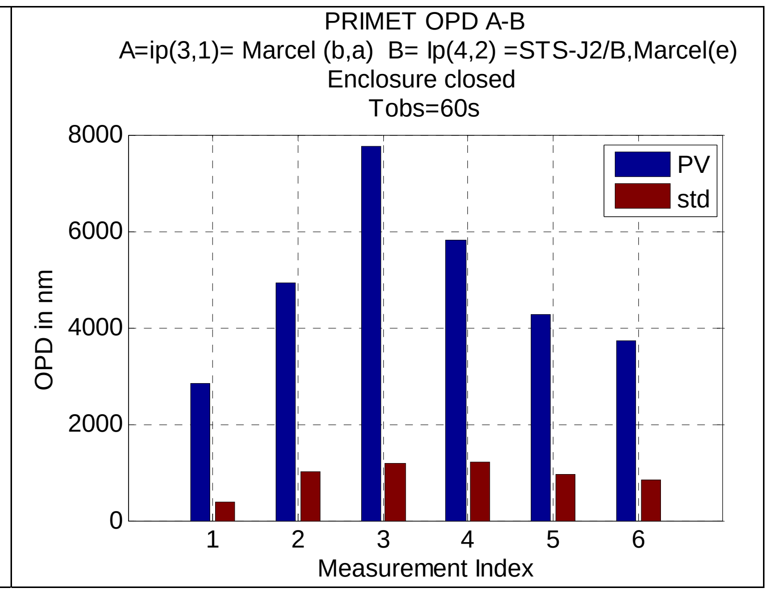
Figure 8: Comparison of 2 types of controllers

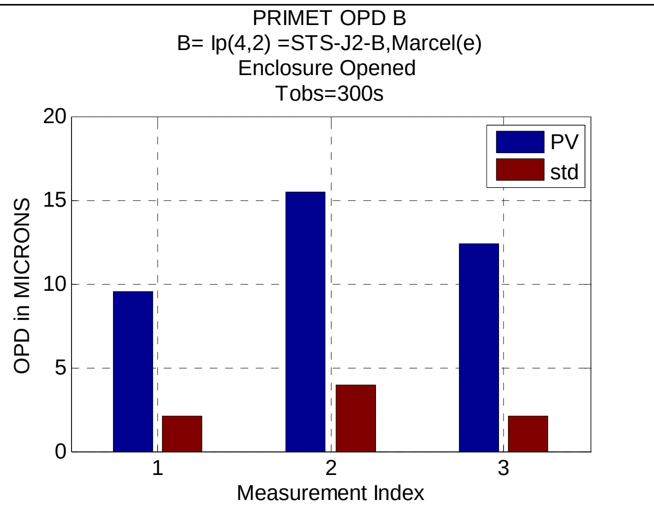
8 SUMMARY OF THE OPD MEASUREMENTS ON LPRMAC (A-B) AND LPRMA2 (-B)



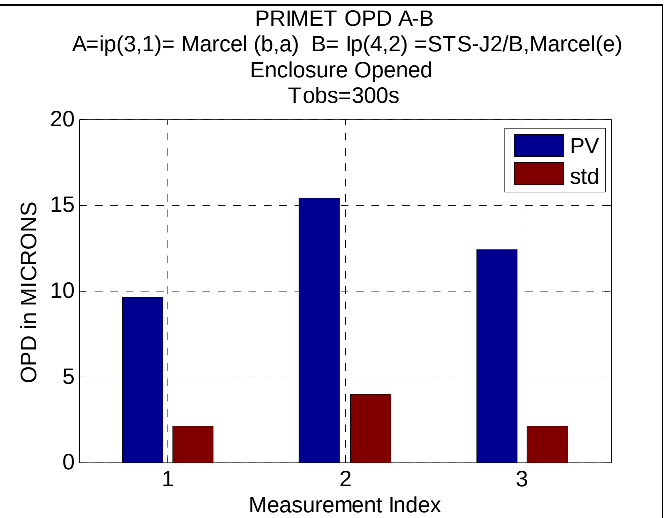








PRIMET OPD B
B= Ip(4,2) =STS-J2-B,Marcel(e)
Enclosure Opened
Tobs=300s
OPD in MICRONS
Measurement Index
PV
std



PRIMET OPD A-B
A=ip(3,1)= Marcel (b,a) B= Ip(4,2) =STS-J2/B,Marcel(e)
Enclosure Opened
Tobs=300s
OPD in MICRONS
Measurement Index
PV
std

9 CONCLUSION

- The Start-up of PRIMET took place without problem after 1.5 months without being operated. The alignment stability appears to be good. Only a marginal re-alignment has been performed to optimize the metrology signals. PRIMET was operated routinely on Marcel and used for FSU calibration. Typical OPD fluctuations recorded on Marcel vary between 50 and 100nm rms over 5 min (~20 nm rms over 10sec)

- Special attention was put to verify the metrology pupil re-imaging using the STS-VCM. Considering that the uncertainty of the Pressure-Curvature calibration of the STS#4-VCM can potentially lead to longitudinal pupil offsets of more than 1 m in the laboratory (see 3.2.3), the results obtained for the metrology beam are somehow consistent. Nevertheless, it is necessary to perform further tests with the correct Pressure-Curvature law, check the exact pupil offset required for the PRIMA table. It seems that optimizing the STS-VCM pressure using ARAL on sky is not precise enough. Finally one has to check if longitudinal pupil offsets of more than 1 m are acceptable during FSU operation.

- PRIMET_B was operated on AT#4-STS/B(**J2**) and Marcel (1 STS yet available, access limited to PRIMET_A because of the tests conducted on FSU_A during the same period). OPD measurements were conducted in this configuration. Typical OPD values reached 4 µm rms over 5 min with an opened enclosure.

- No laser light was retro-reflected from STS-Beam A. Most probably the VCM/A is not well aligned. To be checked on G2 during the next COM period. Until a procedure is elaborated to check the STS-outputs after installation on a given station, we suggest to systematically install an STS on G2, check the beam propagation, and then move the STS to the required station.

- Pupil tracking through the PRIMET extraction optics failed . Most probably because of a vignetting problem introduced by a mask located in the PRIMET extraction optics. This mask is currently necessary to eliminate a ghost image generated by the FSU_BC, which blinds the useful OPD and pupil tracker signals. A solution needs to be elaborated and tested during COM2. We also noticed that if the laser operates at full power, and the AOM at 100% transmission (i.e. as set for OPD measurements), the quadcell saturates even if the gain is at 1. The easiest solution is to insert an additional density filter in front of the quadcell (or a linear polarizor). Reducing the laser power would decrease the robustness of the OPD measurement.

- Nevertheless pupil tracking could be successfully tested by by-passing the PRIMET extraction optics. Closed-loop residuals are within the specifications. We noticed that the scaling [*VCM alignment offset/beam displacement in the lab]* was significantly lower than during similar tests in May2008 (STS#4 on G2). This remains to be investigated.

The status of the tasks defined for COM is given below:

Task 1 PRIMET Start-up: COMPLETED
Task 2 PRIMET Beam alignment on Marcel COMPLETED
Task 3 PRIMET measurement on Marcel: COMPLETED
Task 4 Test of Pupil re-imaging: STARTED, to be continued during COM2
Task 5: Alignment of 2x quadcells: OPEN
Task 6: Pupil tracking: STARTED, to be continued during COM2
Task 7: PRIMET Fringes: STARTED, to be continued during COM2
Task 8: Test PRIMET new State Machine and PRIMET OSF script: OPEN
Task 9: Check new Phase meter overflow conditions: OPEN
Task 10: test DDL transmission (if time allows): OPEN

10 APPENDIX

10.1 Task definition for AIV-COM1

Summary list
Task 1 *PRIMET Start-up: 0.5 day*
Task 2 *PRIMET Beam alignment on Marcel: 0.5 day*
Task 3 *PRIMET measurement on Marcel: 1 hour every day*
Task 4 Test of Pupil re-imaging: 2x 0.5 night and 2 days
Task 5: Alignment of 2x quadcells: 1 day
Task 6: Pupil tracking: 1 day and 3 hours after twilight
Task 7: PRIMET Fringes : 2days and 3 hours every night starting at twilight
Task 8: Test PRIMET new State Machine and PRIMET OSF script: 0.5 day
Task 9: Check new Phase meter overflow conditions: 0.5 day
Task 10: test DDL transmission (TBC if time allows): 0.5 day
Task 11: TBD

Operational constrains while operating with 1 STS and Marcel:
Marcel Ip1 and ip3 (=Telescope 1), so the quadcell corrections must be sent to a non existing IP address. Potentially we have to change the residual guiding threshold because we operate in open loop on those beams. However the beam should be big enough to avoid to do this. The beam detected condition should be always fulfilled, and the beam search will not have to be initiated on those beams.
Ip1 and ip3 correspond to the S polarization.

Task 1 *PRIMET Start-up: 0.5 day*

Identification	***PRIMET Start-up***
Duration	0.5 day (daytime)
Responsible	N.Schuhler
Description	Functional test of all the PRIMET Hardware & software Operate the laser (safety rules apply!) Operate the frequency stabilization Check the cabling of the quadcell Check that the light outputs STS-beam A and B
Prerequisite/Predecessor	PRIMA software installed
Input	-
Output	-
Criteria for Completion	Functional Check list completed.
Successor	-
Manpower Required	-
Facility /Tooling Required	Access to IC102, VLTI lab Access to the FSU warm optics
Sequence /procedure(incl. ref doc)	-

Task 2 *PRIMET Beam alignment on Marcel: 0.5 day*

Identification	***PRIMET Beam alignment on Marcel***
Duration	0.5 day (daytime)
Responsible	N.Schuhler
Description	• Verify the beam alignment of PRIMET_A&B on Marcel. • Adjust the PRIMET injection blocs if need be • Characterize the fringes signals (individual DC, fringe mean and PV) • Check if the red laser propagating through the achromats can be seen on the sigthing scope and be useful for alignment purposes
Prerequisite/Predecessor	***PRIMET Start-up***
Input	-
Output	PRIMET DOPD data files
Criteria for Completion	Metrology fringes detected on Marcel.
Successor	-
Manpower Required	Paranal optics
Facility /Tooling Required	Beam profiler (if need be) Oscilloscope VLTI lab during day-time Access to the FSU warm optics Sighting scope on ip2 or ip4 (DDL side)
Sequence /procedure(incl. ref doc)	-

Task 3 *PRIMET measurement on Marcel: 1 hour every day*

Identification	***PRIMET measurement on Marcel***
Duration	1 hour every day (daytime)
Responsible	N.Schuhler
Description	• Daily measurements of PRIMET_A and PRIMET_B on Marcel to get some statistics on the robustness. • Check the impact of the Marcel fiber on the measured OPD noise • Verify suitability of PRIMET for FSU calibration
Prerequisite/Predecessor	***PRIMET Beam alignment on Marcel*** completed
Input	-
Output	PRIMET DOPD data files
Criteria for Completion	Statistics on internal OPD and robustness over ~1 week
Successor	-
Manpower Required	J.Sahlmann to check the FSU calibration with PRIMET
Facility /Tooling Required	Marcel in autotest This will be operated from the control room
Sequence /procedure(incl. ref doc)	-

Task 4 Test of Pupil re-imaging: 2x 0.5 night and 2 days

Identification	***Test of pupil re-imaging***
Duration	2x 0.5 night and 2 days (TBC)
Responsible	S.Leveque/N.Schuhler
Description	• Verify/check/understand the pupil re-imaging using the VCM's of the STS and DL#4. • Fill out- the tables defined in appendix • Strategy still TBC • Probably we also want to use a “standard” AT • Depending on the results, we may want to attempt fringe measurements at this points
Prerequisite/Predecessor	AT#4-STS installed on J2 ***PRIMET measurement on Marcel***
Input	
Output	At least the optimized DL and STS VCM pressure to guaranty later PRIMET fringe observations
Criteria for Completion	
Successor	
Manpower Required	
Facility /Tooling Required	AT#4-STS; ARAL; ATXX on station XX VLTI lab & tunnel
Sequence /procedure(incl. ref doc)	TBC

Task 5: Alignment of 2x quadcells: 1 day

Identification	***Alignment of 2x quadcells***
Duration	1 day
Responsible	S.Leveque/N.Schuhler
Description	Alignment of the quadcells of ip4&ip3 (AT#4-STS) (the other Ip’s are used on Marcel only)
Prerequisite/Predecessor	***Test of pupil re-imaging***
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	
Facility /Tooling Required	Red laser connected from the storage room, for pre-alignment AT#4-STS Sighting scope on ip3 and ip4 (DDL side) , i.e. used by AT#4 STS VLTI lab & tunnel
Sequence /procedure(incl. ref doc)	-

Task 6: Pupil tracking: 1 day and 3 hours after twilight

Identification	***Pupil tracking in ip4 and ip3***
Duration	1 day and 3 hours qualification tests on sky (can b e done at twilight, as soon as the telescopes can be opened)
Responsible	S.Leveque/N.Schuhler
Description	• Attempt pupil tracking on 2 active quadcells • Measure OL and CL TF and adjust the gain if need be • Check for resonance frequency in the 47 Hz region • Check if the red laser propagating through the achromats can be seen on the STS-TCCD and be useful for alignment purposes
Prerequisite/Predecessor	***Alignment of 2x quadcells***
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	N.DiLieto
Facility /Tooling Required	AT#4-STS (The FSU cannot operate in parallel)
Sequence /procedure(incl. ref doc)	-

Task 7: PRIMET Fringes : 2days and 3 hours every night starting at twilight

Identification	***PRIMET Fringes***
Duration	2 days and 3 hours qualification tests on sky every days (can be done at twilight, as soon as the telescopes can be opened)
Responsible	S.Leveque/N.Schuhler
Description	• PRIMET fringes on AT#4-STS and Marcel • Check impact of DL motion and opened enclosure • Check OPL signs (DL & LMOT) • Qualify pupil tracking, fringe robustness and drop-out • Check impact of FSM calibration mode ; FSM IRIS correction (send data file to the FSM) • Make Batch file to record metrology data
Prerequisite/Predecessor	***Pupil tracking in ip4 and ip3***
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	
Facility /Tooling Required	
Sequence /procedure(incl. ref doc)	-

Task 8: Test PRIMET new State Machine and PRIMET OSF script: 0.5 day

Identification	***Test PRIMET new State Machine and OSF script***

Duration	0.5 day
Responsible	S.Leveque/N.Schuhler
Description	
Prerequisite/Predecessor	
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	
Facility /Tooling Required	
Sequence /procedure(incl. ref doc)	-

Task 9: Check new Phase meter overflow conditions: 0.5 day

Identification	***Check new Phase meter overflow conditions***
Duration	0.5 day
Responsible	S.Leveque/N.Schuhler
Description	Maybe we should check if the spare phase meter is working OK and make the modif on this one ?
Prerequisite/Predecessor	
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	
Facility /Tooling Required	
Sequence /procedure(incl. ref doc)	-

Task 10: test DDL transmission (TBC if time allows): 0.5 day

Identification	***Test DDL transmission***
Duration	0.5 day
Responsible	S.Leveque/N.Schuhler
Description	
Prerequisite/Predecessor	
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	
Facility /Tooling Required	
Sequence /procedure(incl. ref doc)	-

Task 11: TBD

Identification	
Duration	
Responsible	
Description	
Prerequisite/Predecessor	
Input	
Output	
Criteria for Completion	
Successor	
Manpower Required	
Facility /Tooling Required	
Sequence /procedure(incl. ref doc)	-

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