

Dihedron

Status Report

18 July 2011

Dihedron - Status

Substrates

1. 2 substrates have been polished;
2. surfaces measured by TNO;

Short Mirror – Side A

low frequency

TNO innovation
for life

P.O. Box 155
2600 AD Delft
The Netherlands

RMS: 0.17 nm

Surface Data
size: 4.5 x 3.5 mm²

Surface Statistics:

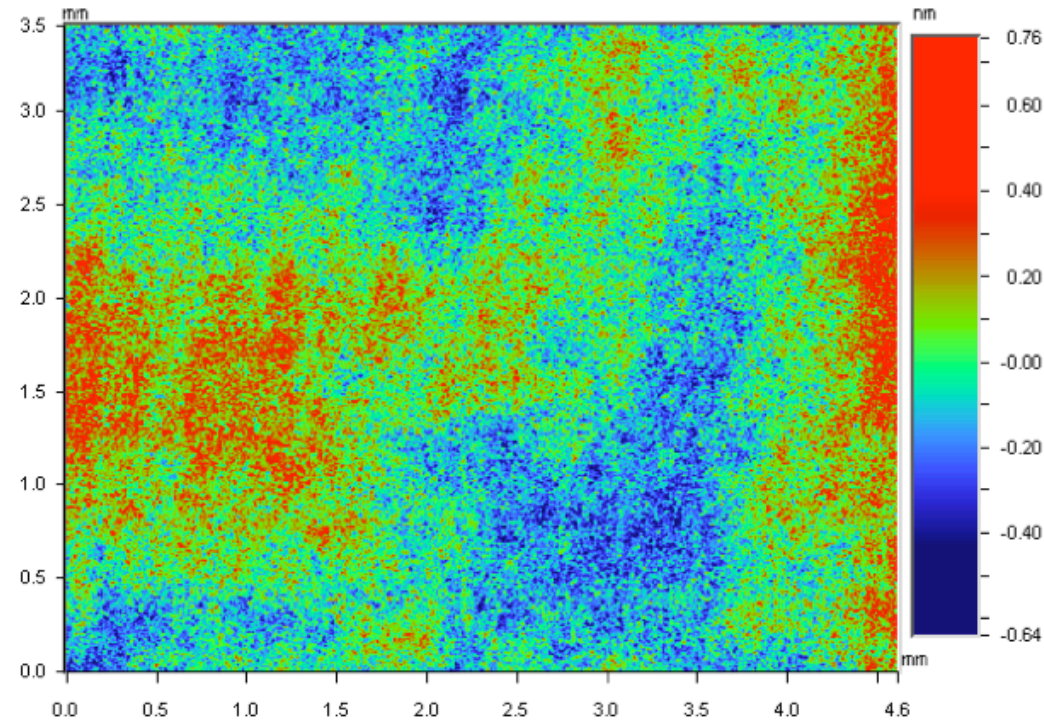
Ra: 0.13 nm
Rq: 0.17 nm
Rz: 1.30 nm
Rt: 1.40 nm

Set-up Parameters:

Size: 640 X 480
Sampling: 7.22 μ m

Processed Options:

Terms Removed:
Tilt
Filtering:
None



Project: Dihadron
Item: Short mirror - Side A
Notes: 6x average

Stage X: 44.82 mm
Stage Y: 39.83 mm

FOV: .5 X
Objective Mag: 2.47
Percent Valid Points: 100.00 %

Mag: 1.4 X
Mode: PSI
Date: 04/27/2011

Short Mirror – Side A

medium frequency



P.O. Box 155
2600 AD Delft
The Netherlands

RMS: 0.16 nm

Surface Data
size: 315 x 236 μm^2

Surface Statistics:

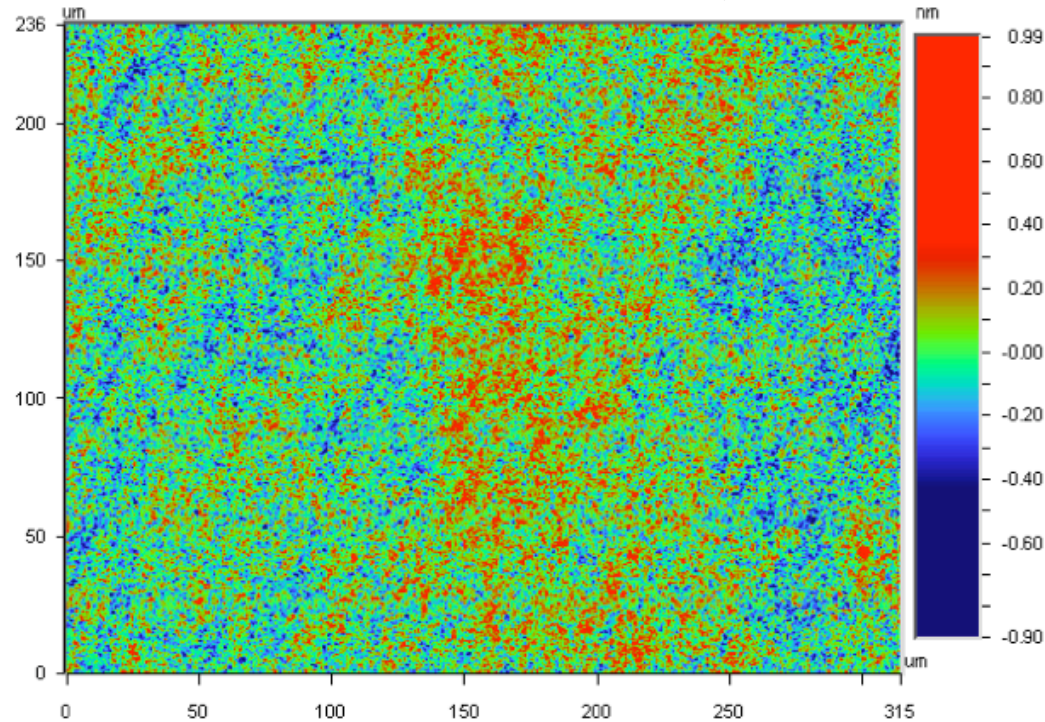
Ra: 0.13 nm
Rq: 0.16 nm
Rz: 1.46 nm
Rt: 1.89 nm

Set-up Parameters:

Size: 640 X 480
Sampling: 492.21 nm

Processed Options:

Terms Removed:
Tilt
Filtering:
None



Project: Dihadron
Item: Short mirror - Side A
Notes: 6x average

Stage X: 44.88 mm
Stage Y: 39.90 mm

FOV: 1.0 X
Objective Mag: 20.11
Percent Valid Points: 100.00 %

Mag: 20.1 X
Mode: PSI
Date: 04/27/2011

Short Mirror – Side A

high frequency

TNO innovation
for life

P.O. Box 155
2600 AD Delft
The Netherlands

RMS: 0.14 nm

Surface Data
size: 63 x 47 μm^2

Surface Statistics:

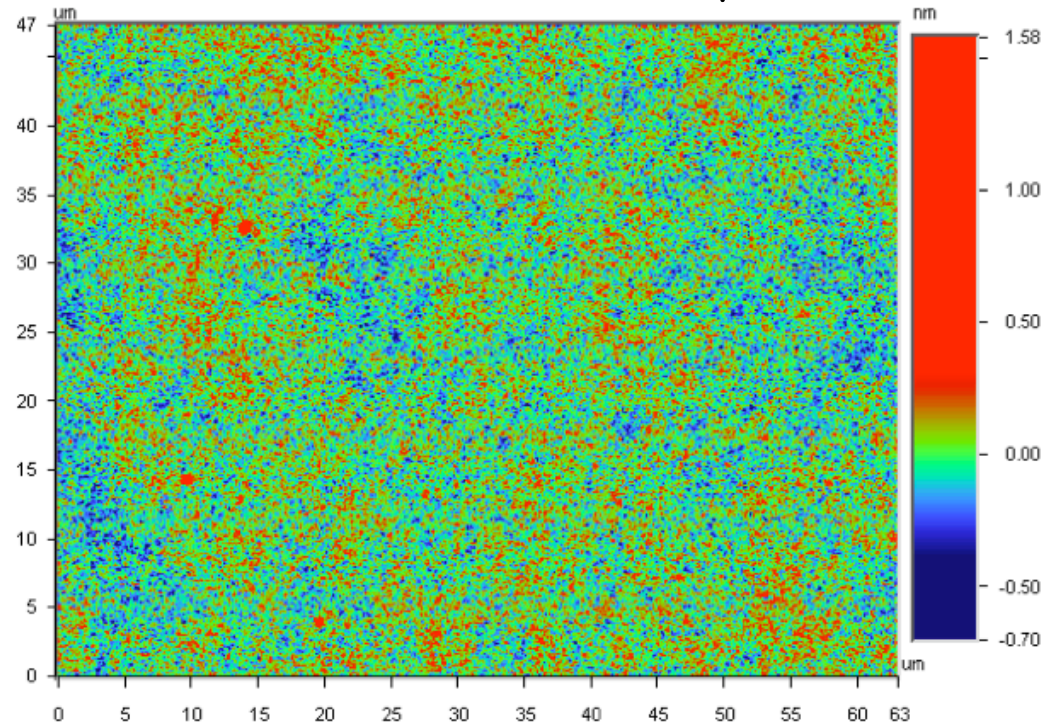
Ra: 0.11 nm
Rq: 0.14 nm
Rz: 1.37 nm
Rt: 2.28 nm

Set-up Parameters:

Size: 640 X 480
Sampling: 98.73 nm

Processed Options:

Terms Removed:
Tilt
Filtering:
None



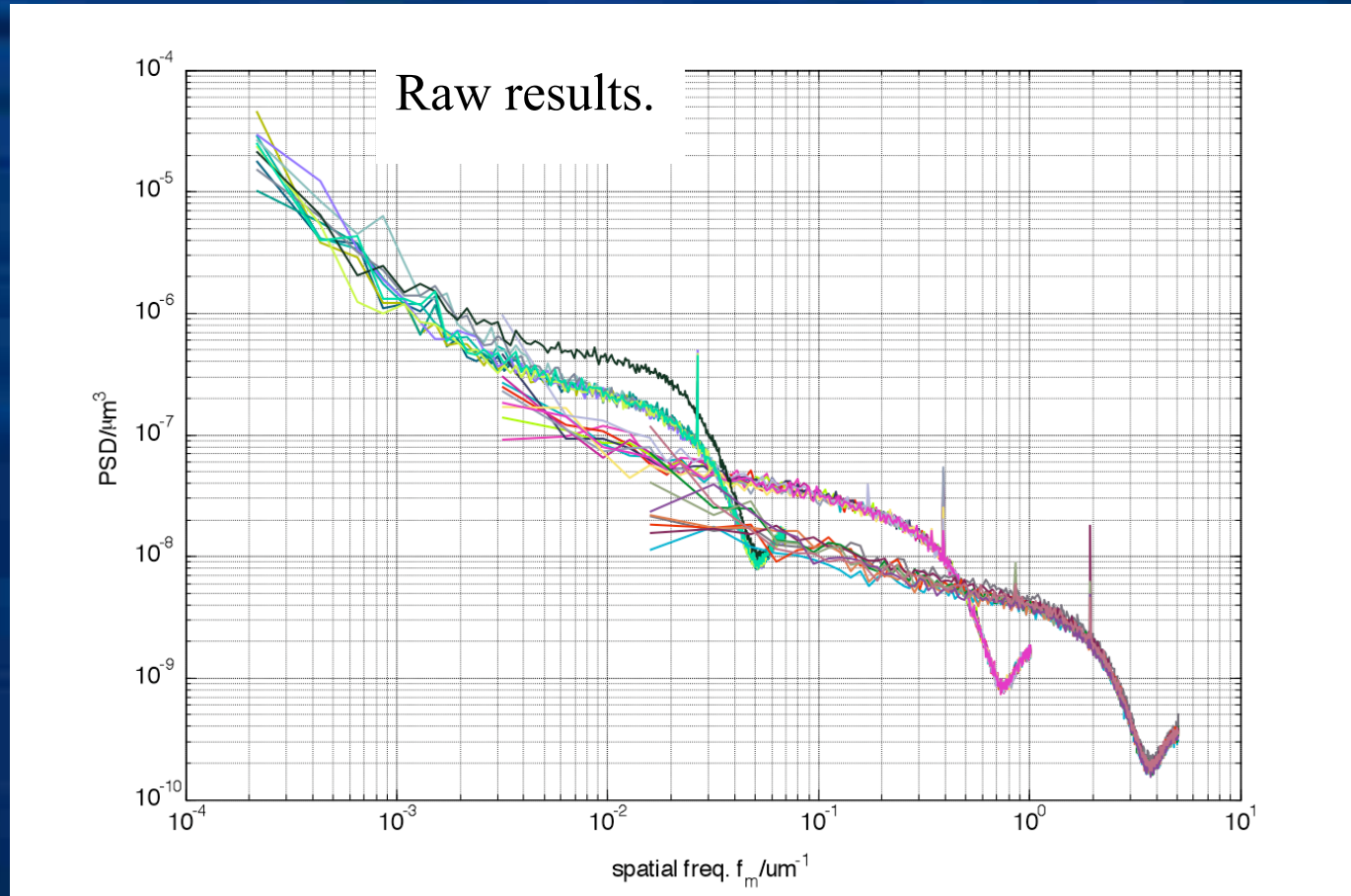
Project: Dihadron
Item: Short mirror - Side A
Notes: 6x average

Stage X: 44.93 mm
Stage Y: 39.94 mm

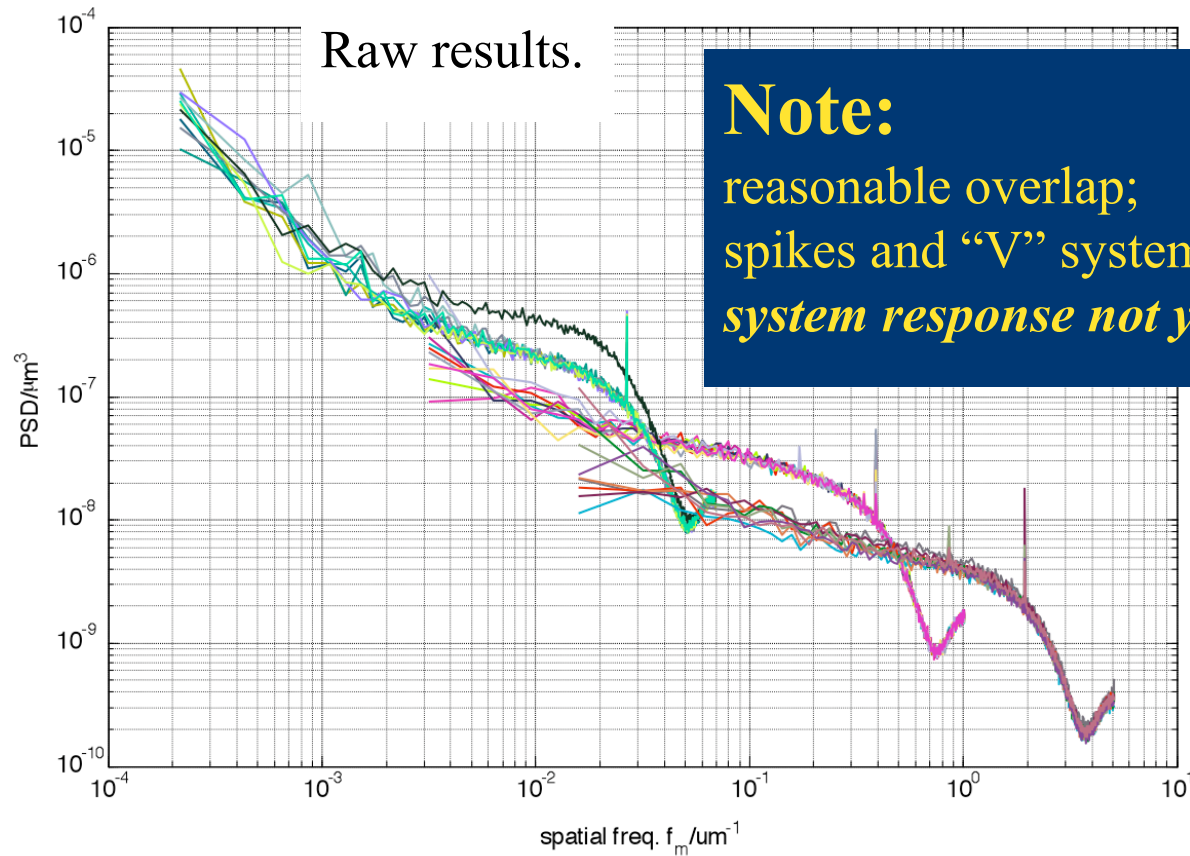
FOV: 2.0 X
Objective Mag: 50.33
Percent Valid Points: 100.00 %

Mag: 100.3 X
Mode: PSI
Date: 04/27/2011

PSD – curves : Short Mirror – Side A



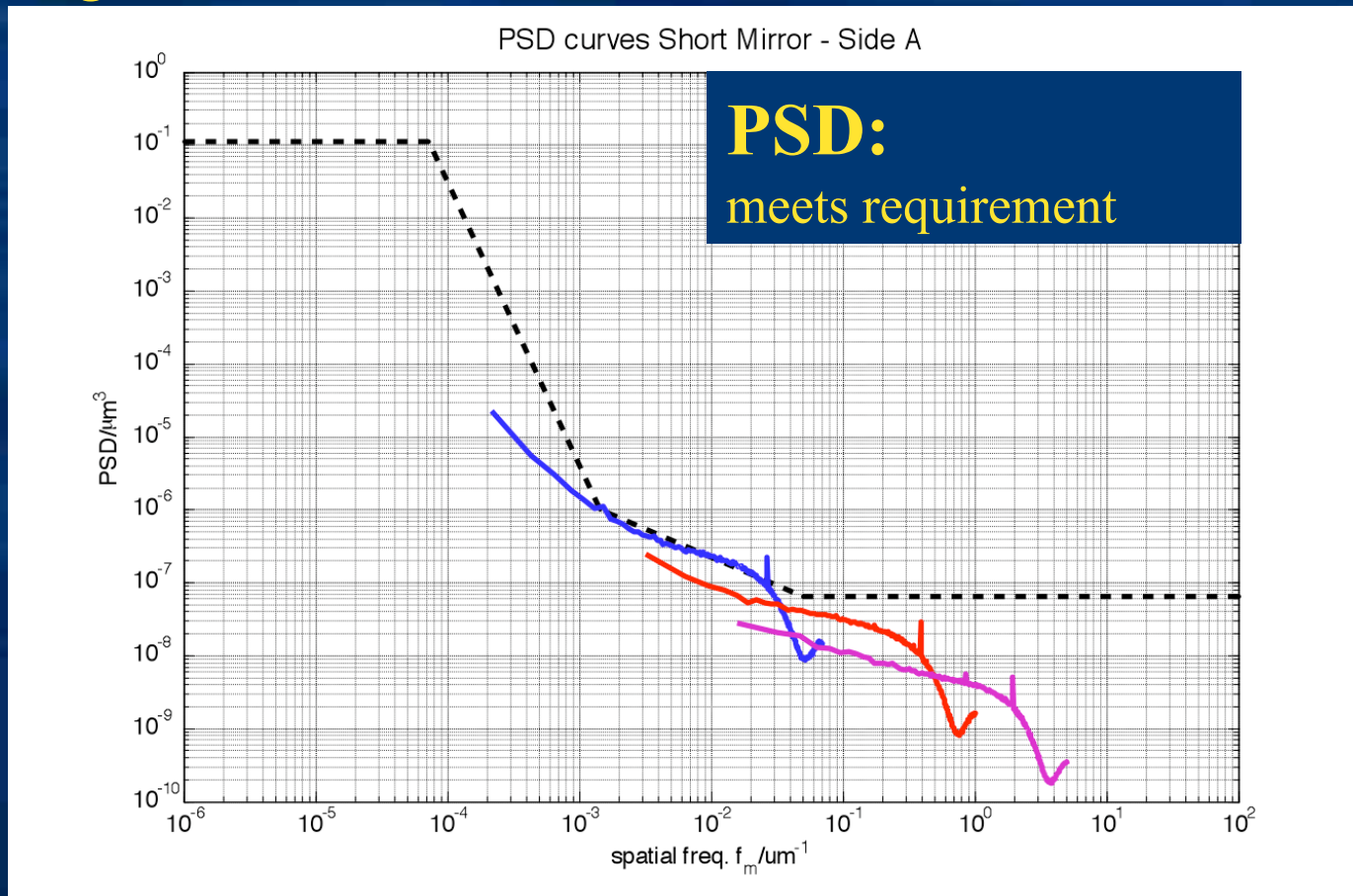
PSD – curves : Short Mirror – Side A



Note:
reasonable overlap;
spikes and “V” system immanent;
system response not yet corrected.

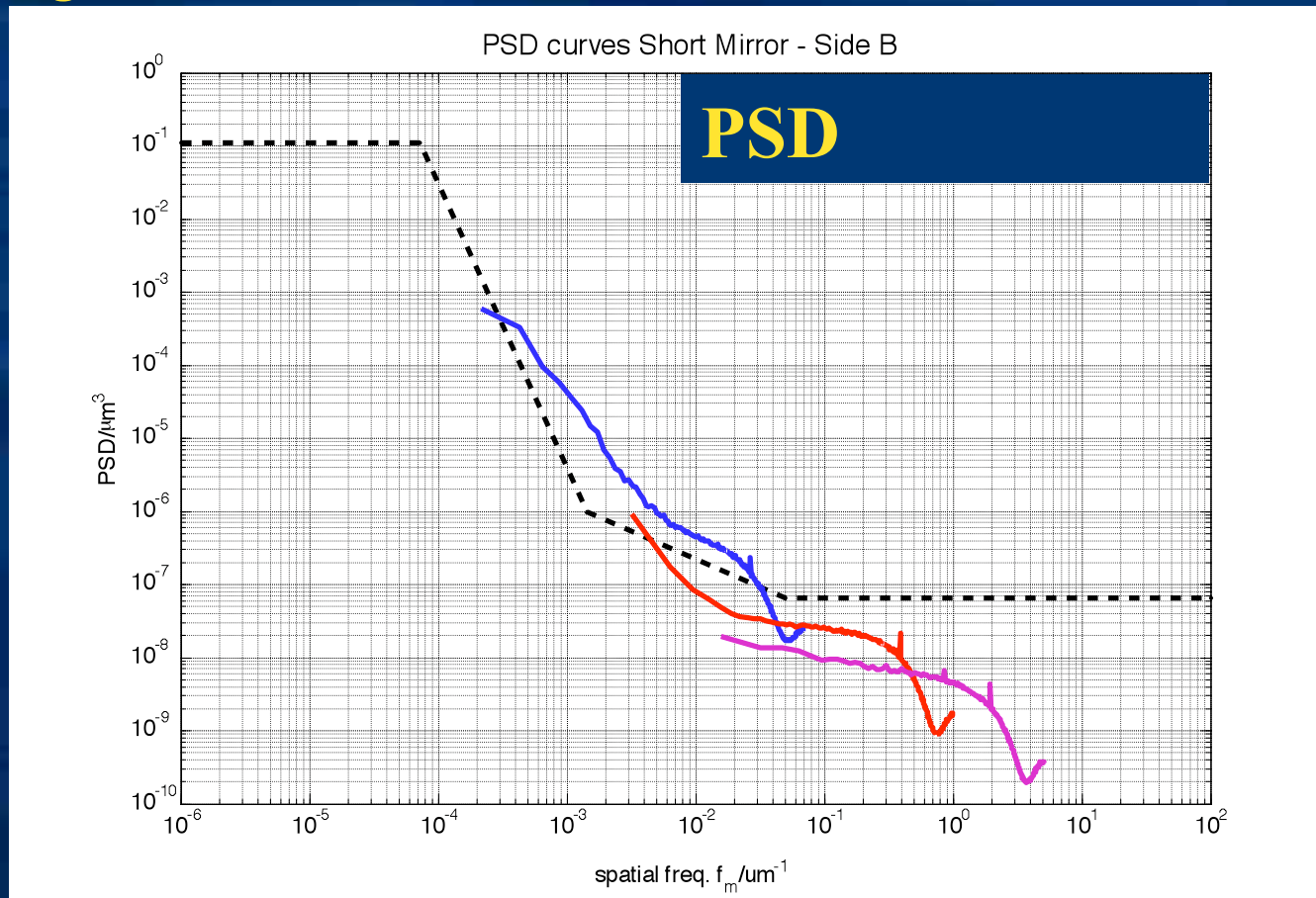
PSD – curves : Short Mirror – Side A

averaged PSD curves

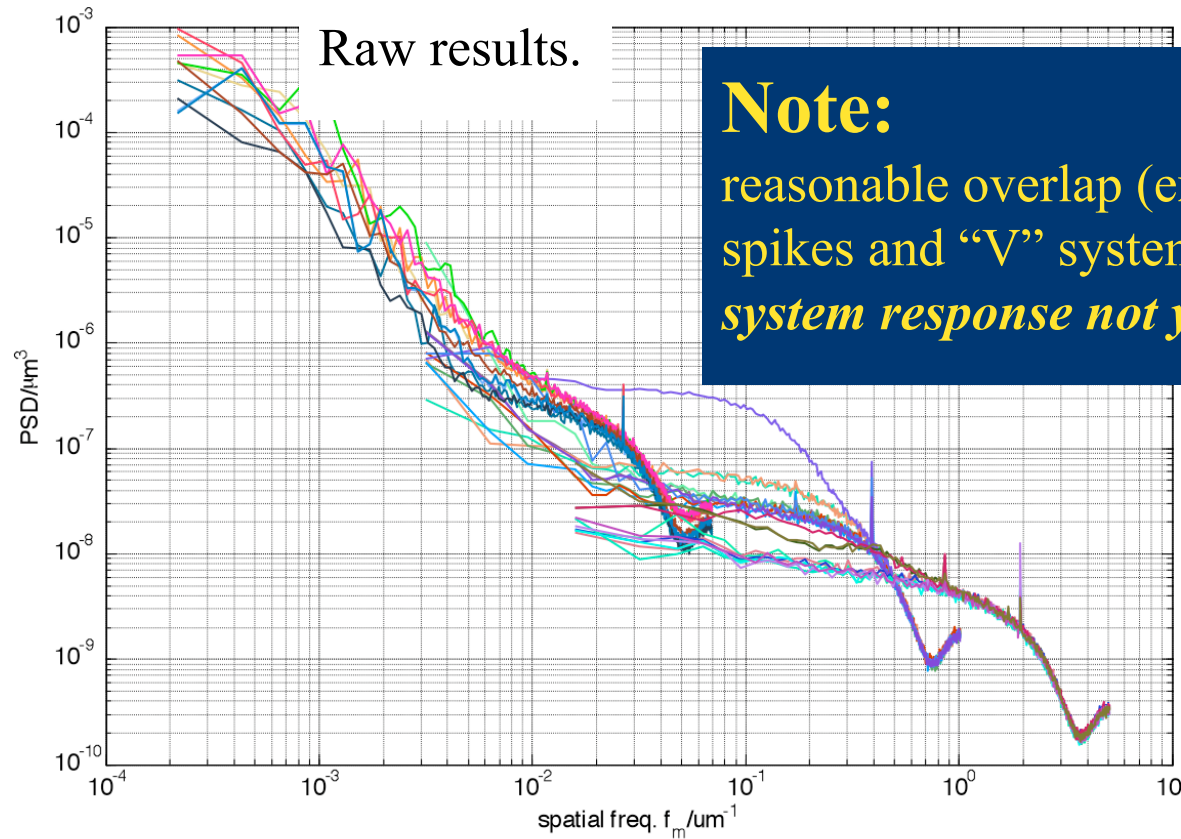


PSD – curves : Short Mirror – Side B

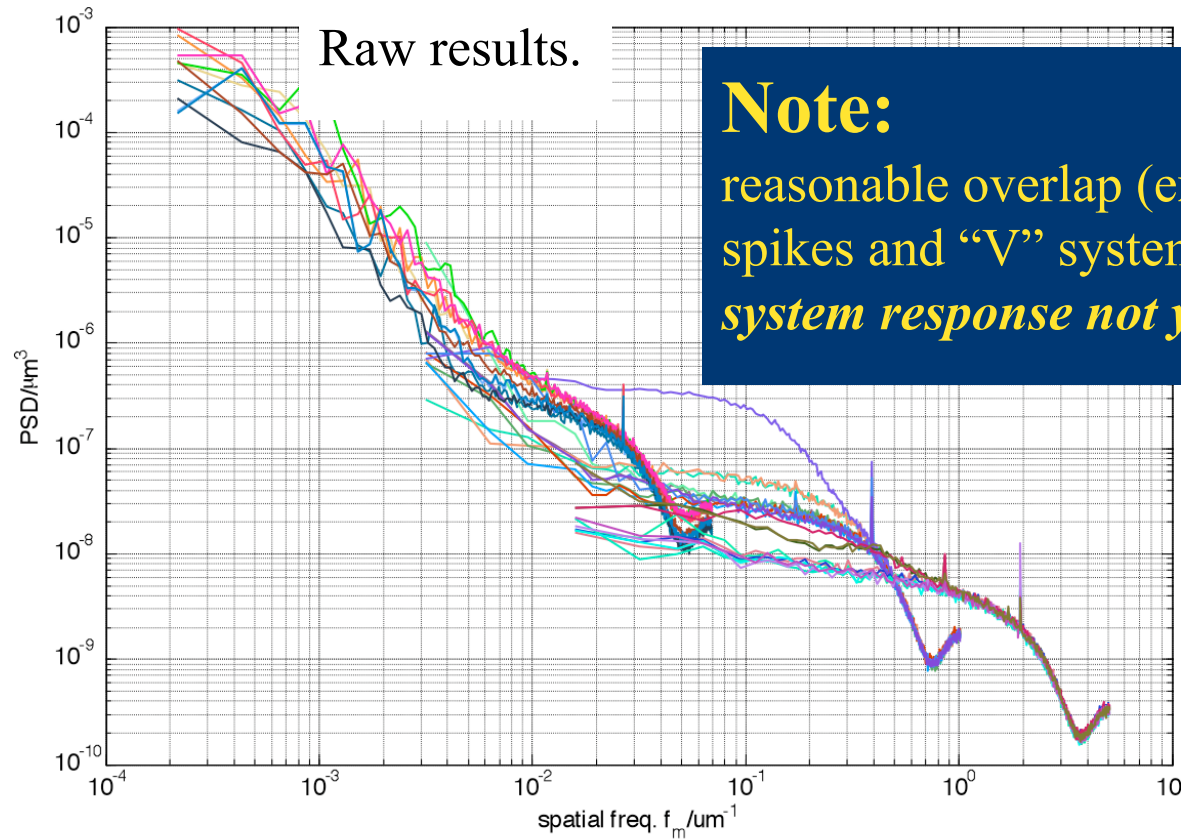
averaged PSD curves



PSD – curves : Long Mirror – Side A



PSD – curves : Long Mirror – Side A



repolished, measured only at LMA.

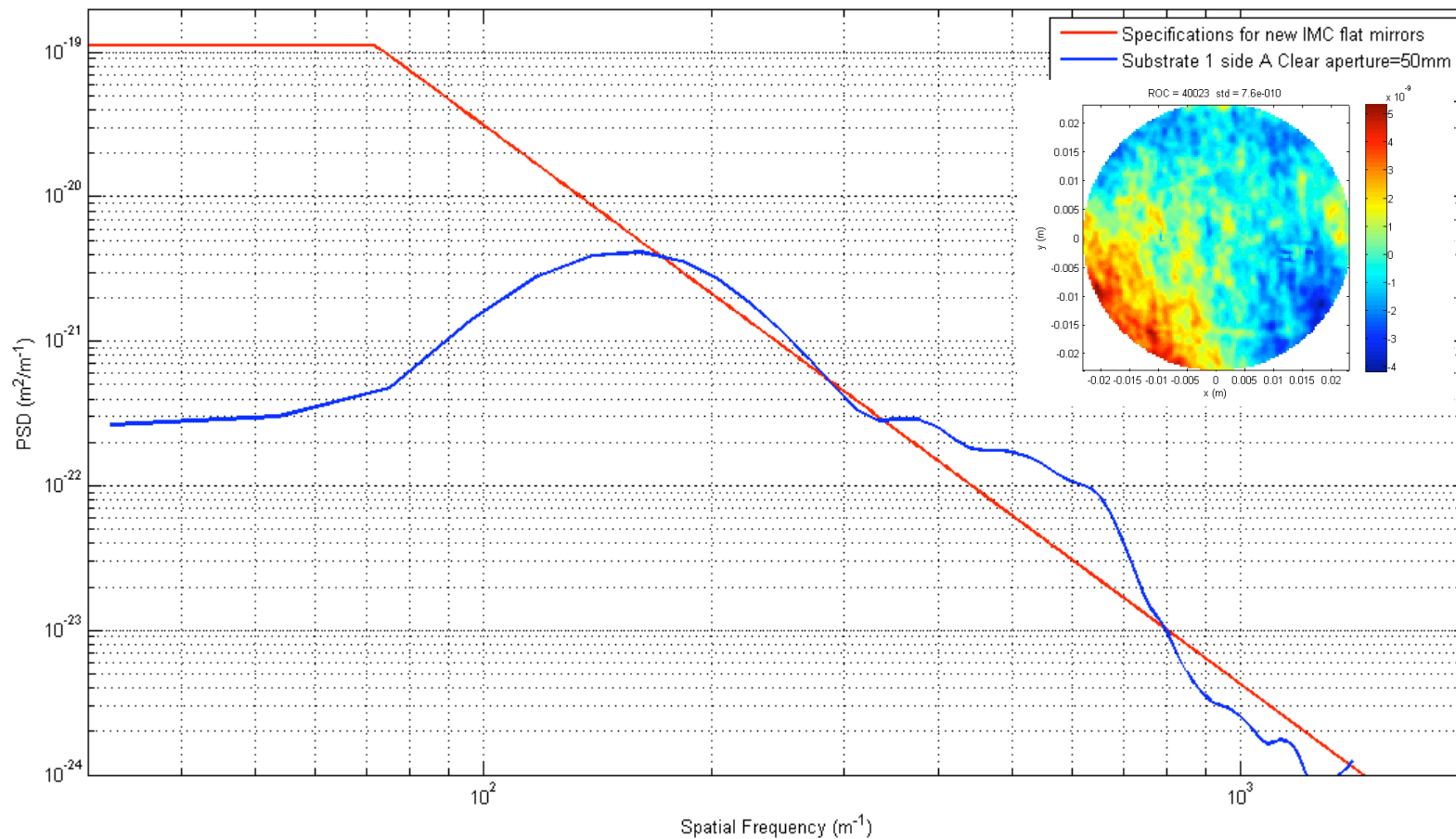
Dihedron - Status

Substrates

1. 2 substrates have been polished;
2. surfaces measured by TNO;
3. sent to LMA for acceptance measurements and coating

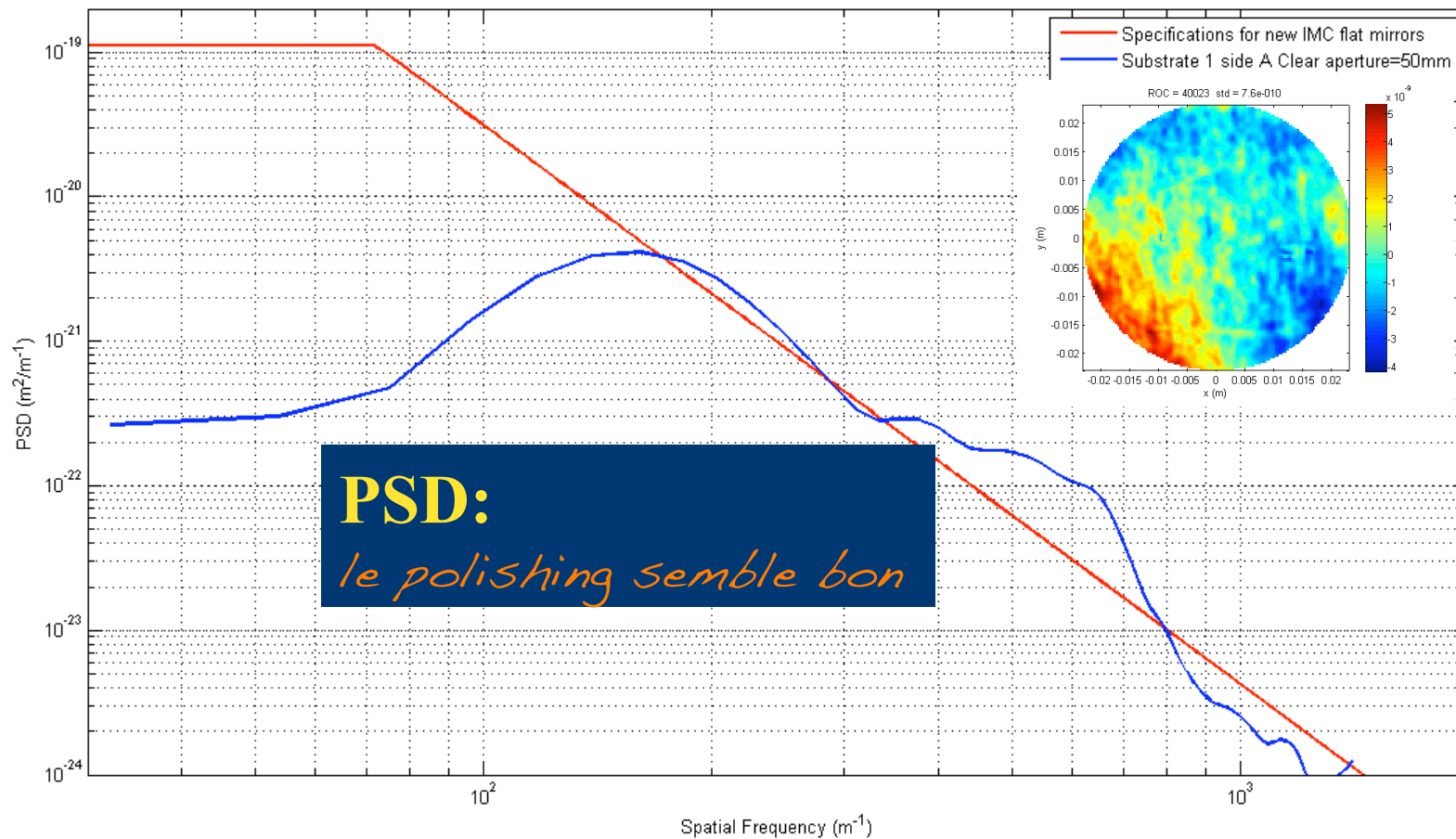
PSD – curves : Short Mirror – Side A (LMA)

Substrate 1 – side A clear aperture 50mm



PSD – curves : Short Mirror – Side A (LMA)

Substrate 1 – side A clear aperture 50mm



Dihedron - Status

Substrates

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3. sent to LMA for acceptance measurements and coating :
“le polishing semble bon” ;

Dihedron - Status

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“le polishing semble bon” ;
4. *but*: coating not before end Octobre ;

Dihedron - Status

Substrates

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“le polishing semble bon” ;
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supports :

Dihedron - Status

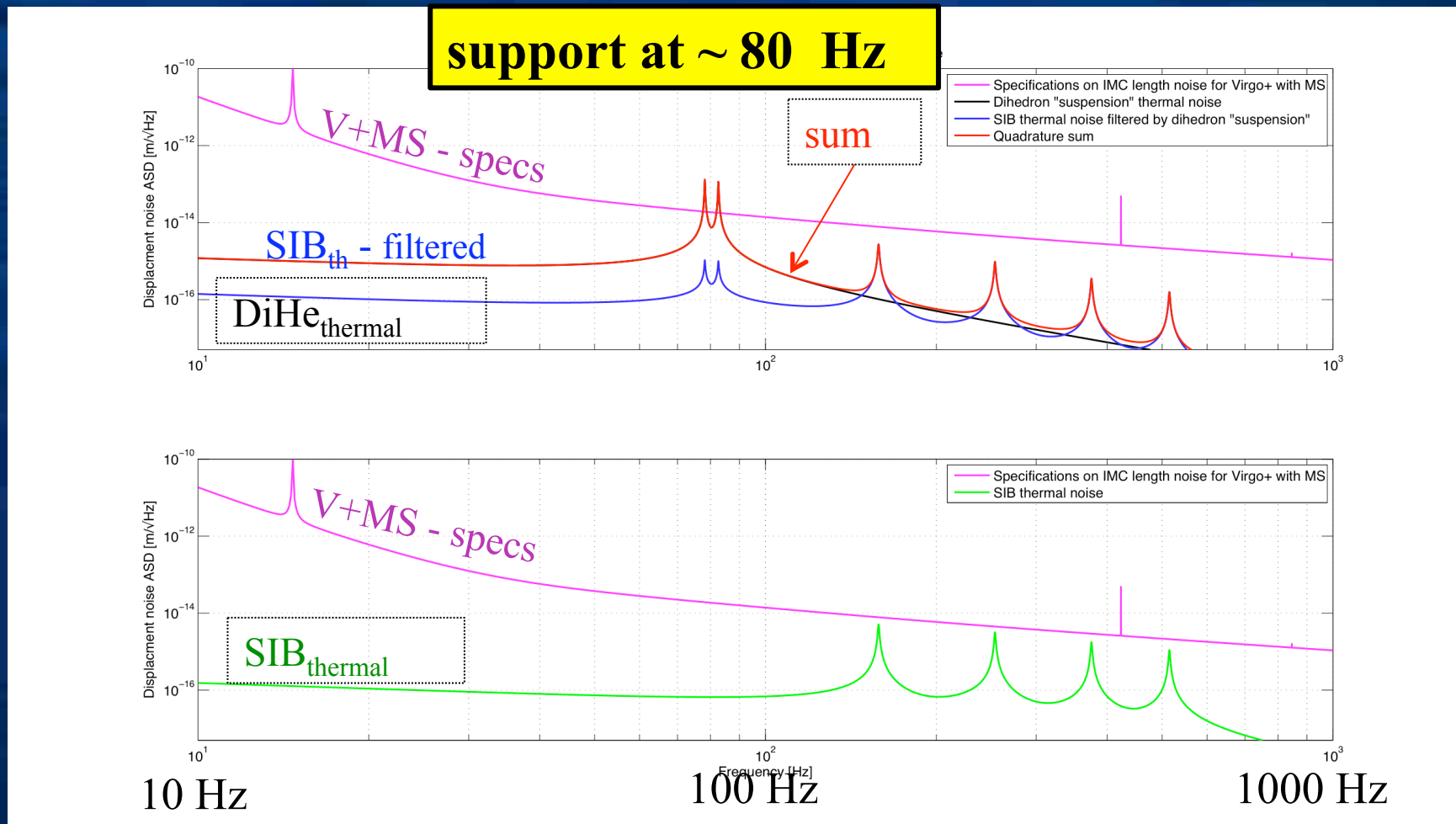
Supports

Dihedron - Status

Supports

1. present support causes resonances around 80 Hz ;
2. we were working on soft support ($\nu \sim 10 \dots 15$ Hz) ;
3. problem: *can this work without a control system ? ?*

SIB thermal noise



David Rabeling

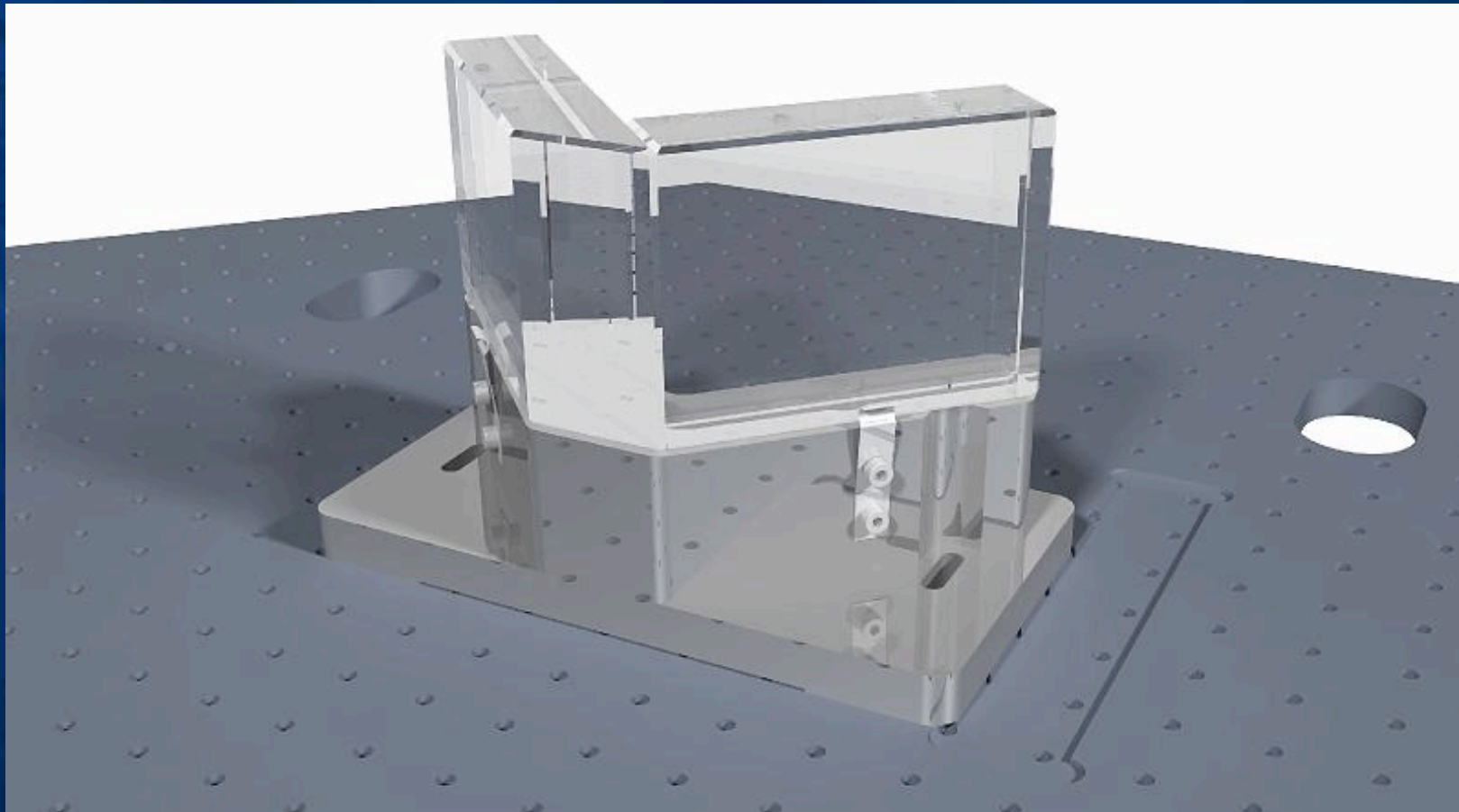
Dihedron - Status

Supports

1. present support causes resonances around 80 Hz ;
2. had been working on soft support ($\nu \sim 10 \dots 15$ Hz) ;
3. problem: *can this work without a control system ? ?*
4. in fact, soft support might not be needed . . .
5. earlier this year decided to produce solid support :
dubbed "*monolithic*" ;
6. 2 solid supports with different contact points ;

monolithic support

Flat tops



monolithic support



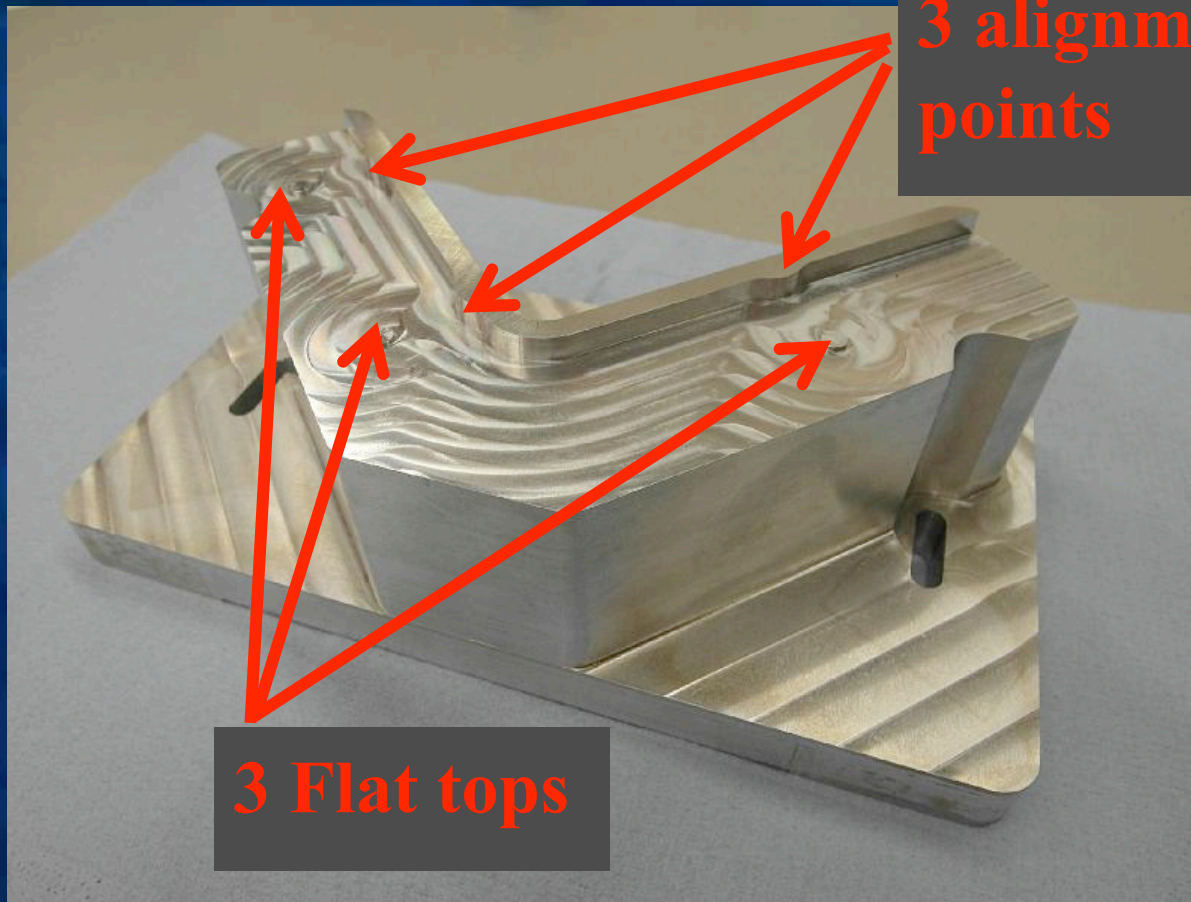
Flat tops

Flat tops:

Dihedron rests on little protruding circles; positioned with springs against alignment points .

monolithic support

Flat tops

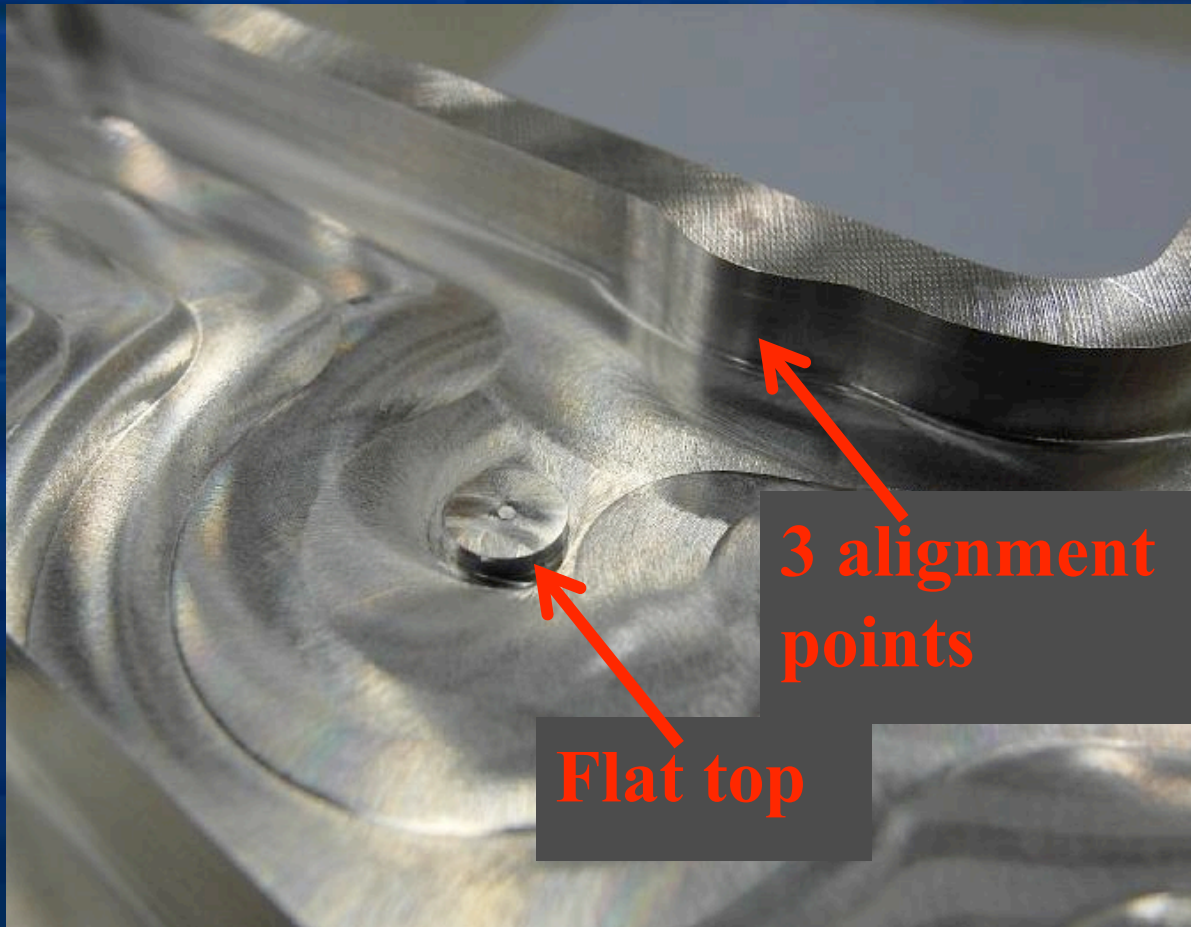


3 alignment points

3 Flat tops

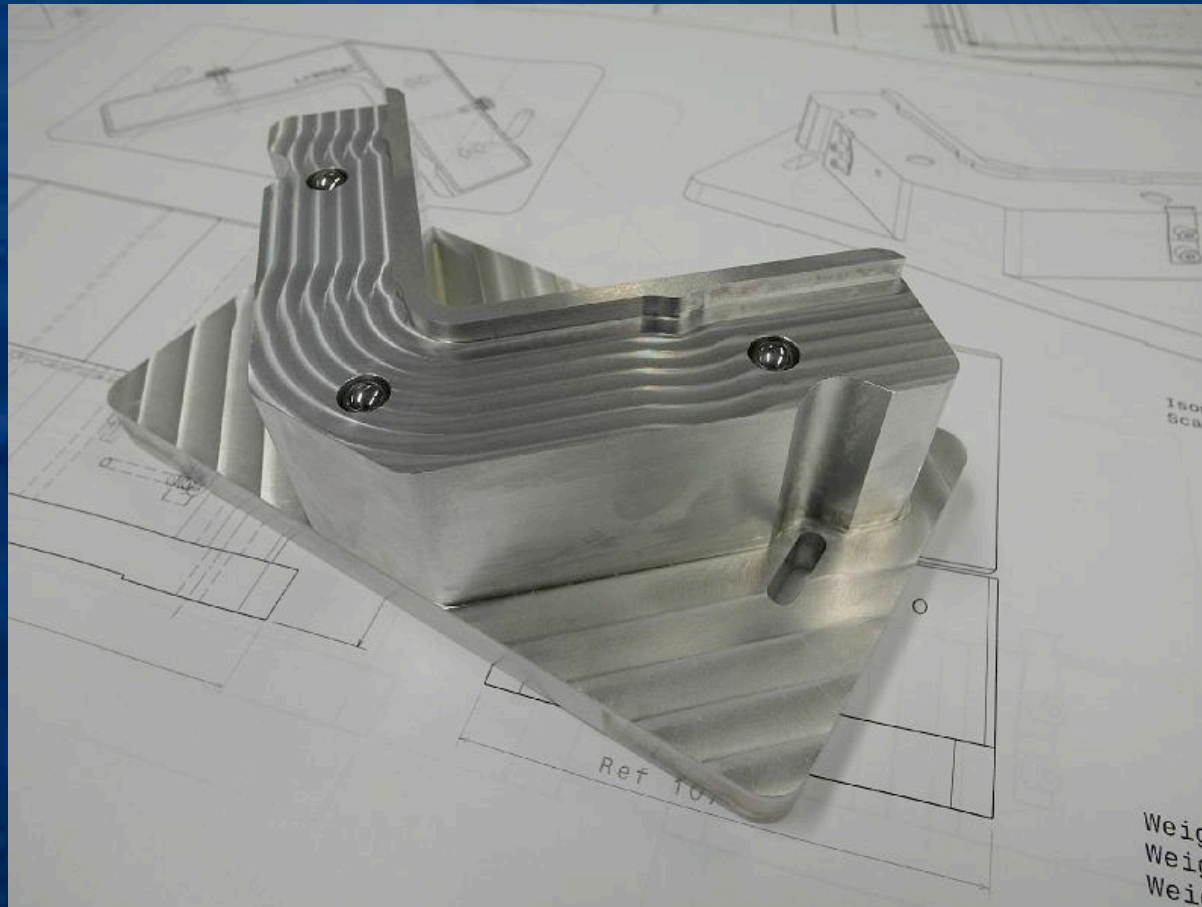
monolithic support

Flat tops



monolithic support

Steel spheres



monolithic support

Steel spheres



sphere in
conical hole

monolithic support

Steel spheres



Dihedron - Status

Question:

Dihedron - Status

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is the plane defined by the 3 spheres
parallel to ground plate?

Dihedron - Status

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is the plane defined by the 3 spheres
parallel to ground plate?

this has been measured,

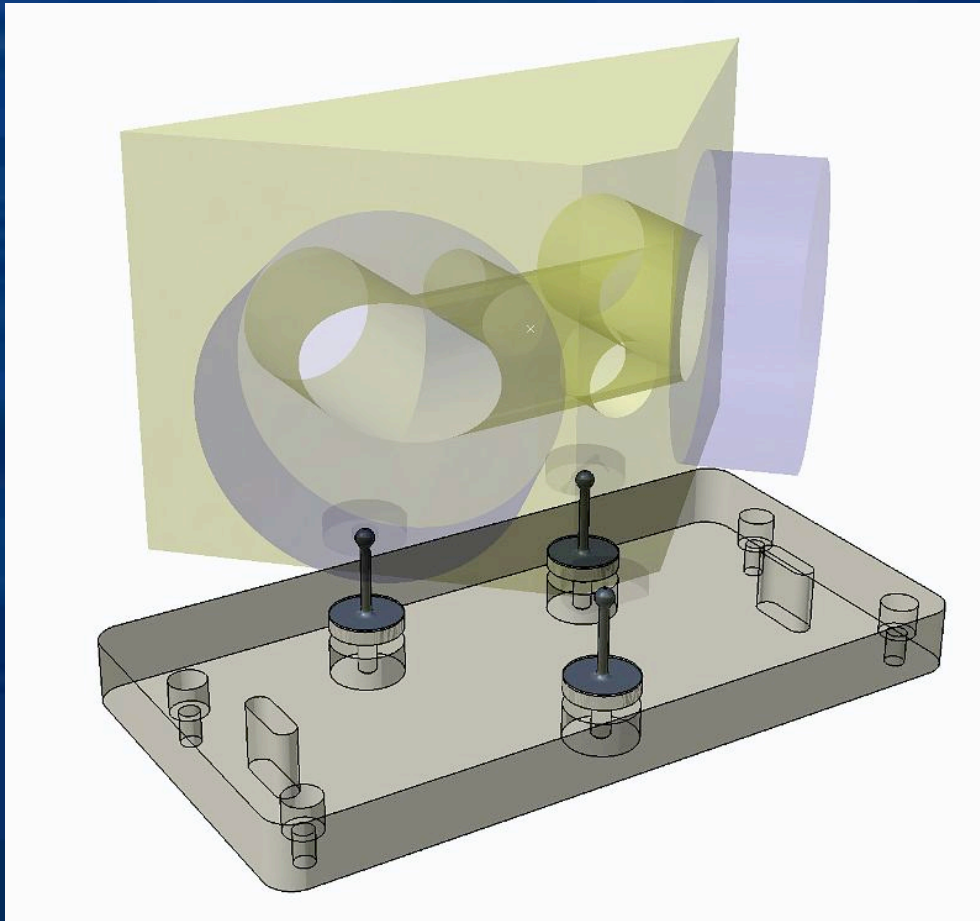
deviation is $< 3 \mu\text{m}$ (probably less than $1 \mu\text{m}$)
(corresponding to angle of $\sim 10^{-5}$)

Dihedron - Status

Supports

1. coating *not* before end Octobre :
2. can we establish that
 - *either*: monolithic support does not transmit thermal noise of SIB;
 - *or*: we need an attenuation of thermal noise of SIB ?
3. Solution:
 - mount present dihedron on a monolithic support.
 - this should eliminate resonances at ~ 80 Hz;
 - if new resonances appear: must develop a controlled support . . .

old Dihe + monolithic support

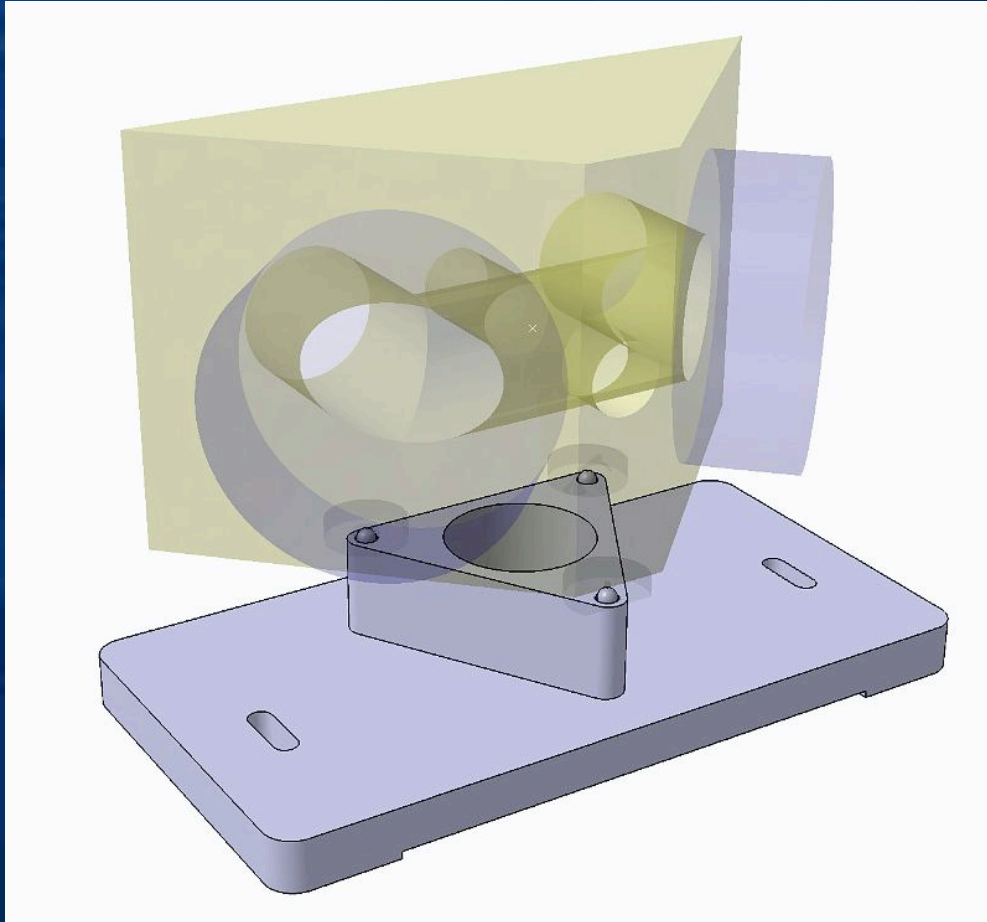


actual situation:

Dihedron rests on legs;

positioned with
“point-straight-plane”
method.

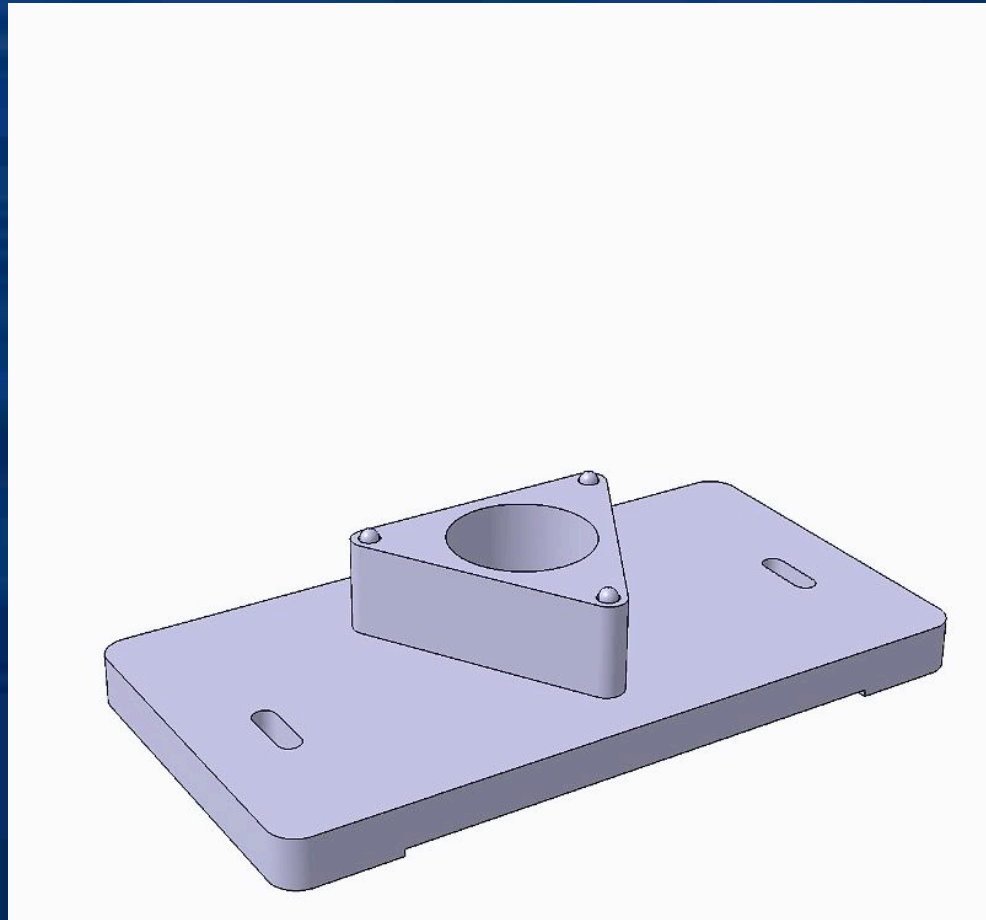
old DiHe + monolithic support



replace legs by 3 spheres

position DiHe with
“point-straight-plane”
method.

old Dihe + monolithic support



design ready,
to be machined.

Summary

- **Dihedron advances:**
- **2 substrates ready, surfaces measured ;**
 - **coating to be done by LMA ;**
 - **ready by 2nd half Octobre .**
- **3 leg support :**
 - **not considered optimal ;**
 - **2 new supports produced; “flat top” and “steel spheres” ;**
 - **ready for characterization .**
- **since coating is delayed :**
 - **test if thermal noise of SIB requires attenuation :**
 - **new support “steel spheres” for old DiHe designed ;**
 - **ready for machining and characterization .**