Monolithic suspensions in Virgo

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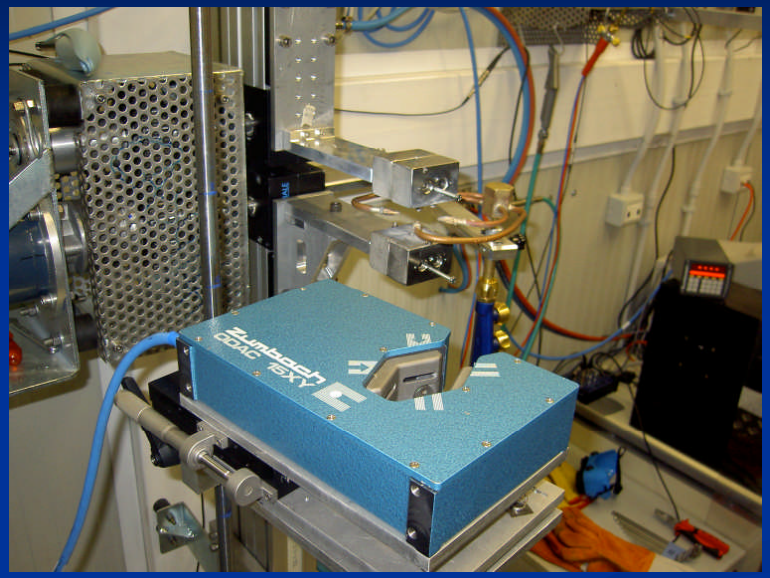
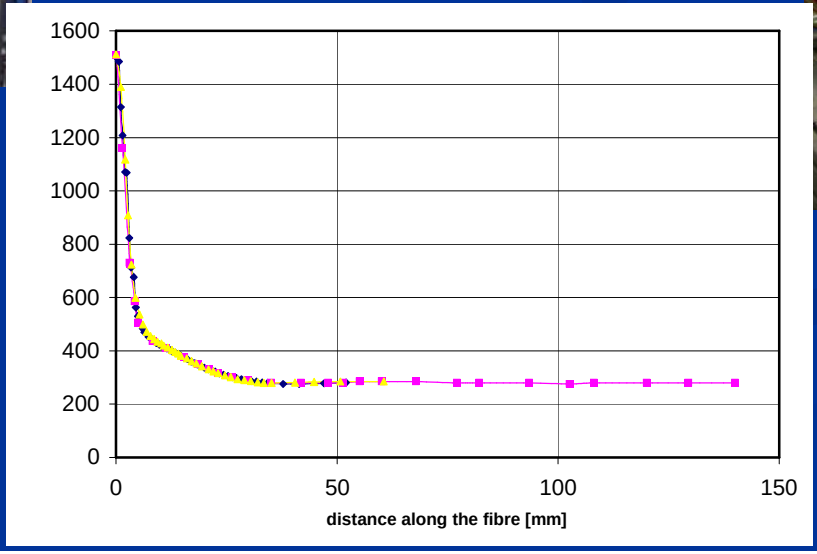
Status

- *Two fibre pulling machines available (in Perugia and Cascina);*
- *One laser CO_2 machine available in Cascina (developed by the Glasgow group);*
- *A validation procedure for fibre production has been defined;*
- *Good results and reproducibility of the silicate bonding technique;*
- *The project of the present structure of the dummy suspension has been defined (mirror, inserts, ears, clamps, marionetta… in collaboration with the Rome and Florence groups);*
- *… few tests have been made;*

Fiber production machines





Fiber production procedure

Main steps:

- *Fused silica RODs: supply and storage.*
- *Fiber pulling*
- *Fiber validation*
- *Handling and Storage*

Validation procedure

We improved our control on the fiber surface quality using a portable very thin flame welding machine. It is possible to check and repair the fiber surface and increase the validated fiber quality.

80 μm fiber

It is possible to:

- *rearrange the surface defects and cracks;*
- *weld fibers in the low diameter part accurately;*

We are evaluating the optimum diameter for the welding to minimize the losses induced.

Validation procedure (2)

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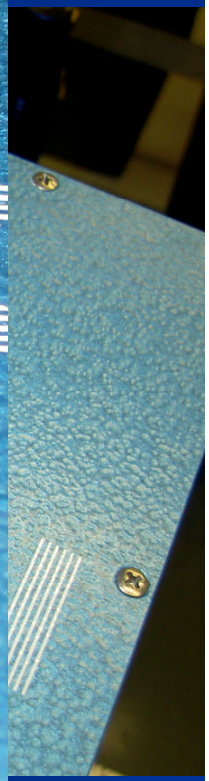


Potassium silicate bonding

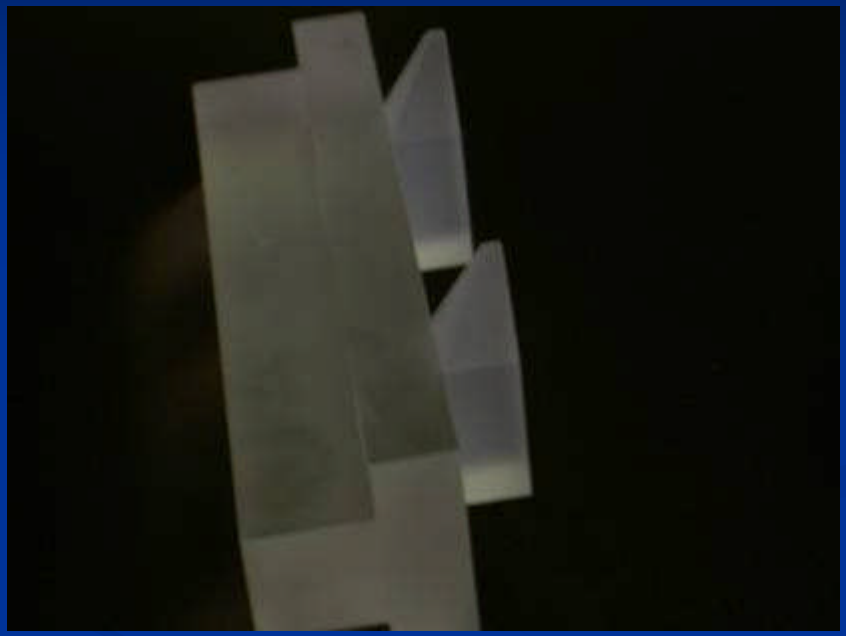
Silicate bonding procedure has been validated and tested on different substrates.
Breaking strength versus time of samples with different flatness quality has been investigated (λ/4, λ/7 and λ/10).

- Tests have been made in a class 10000 clean room, under a class 100 laminar flux.

Other tests are ongoing for the bonding of Si-Si, Al_2O_3-Al_2O_3 and Si-Al_2O_3 samples of different crystal orientations with better results respect to FS.

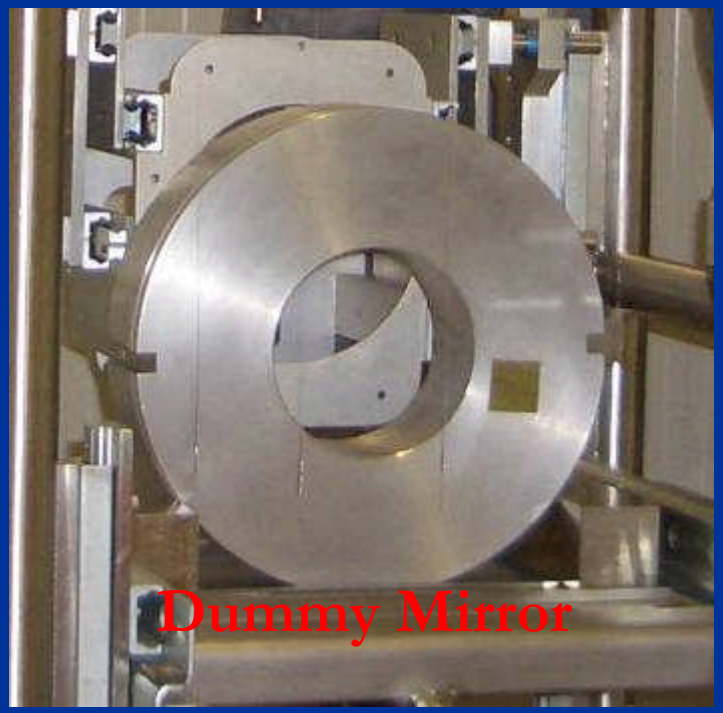
Structure of the trial suspension

In October 2006 a trial suspension has been made using an aluminum mirror with two FS inserts with a λ/10 surface on which two ears have been bonded.



The upper part of the wire is welded to a FS clamp fixed to the dummy marionetta.

Dummy Marionetta

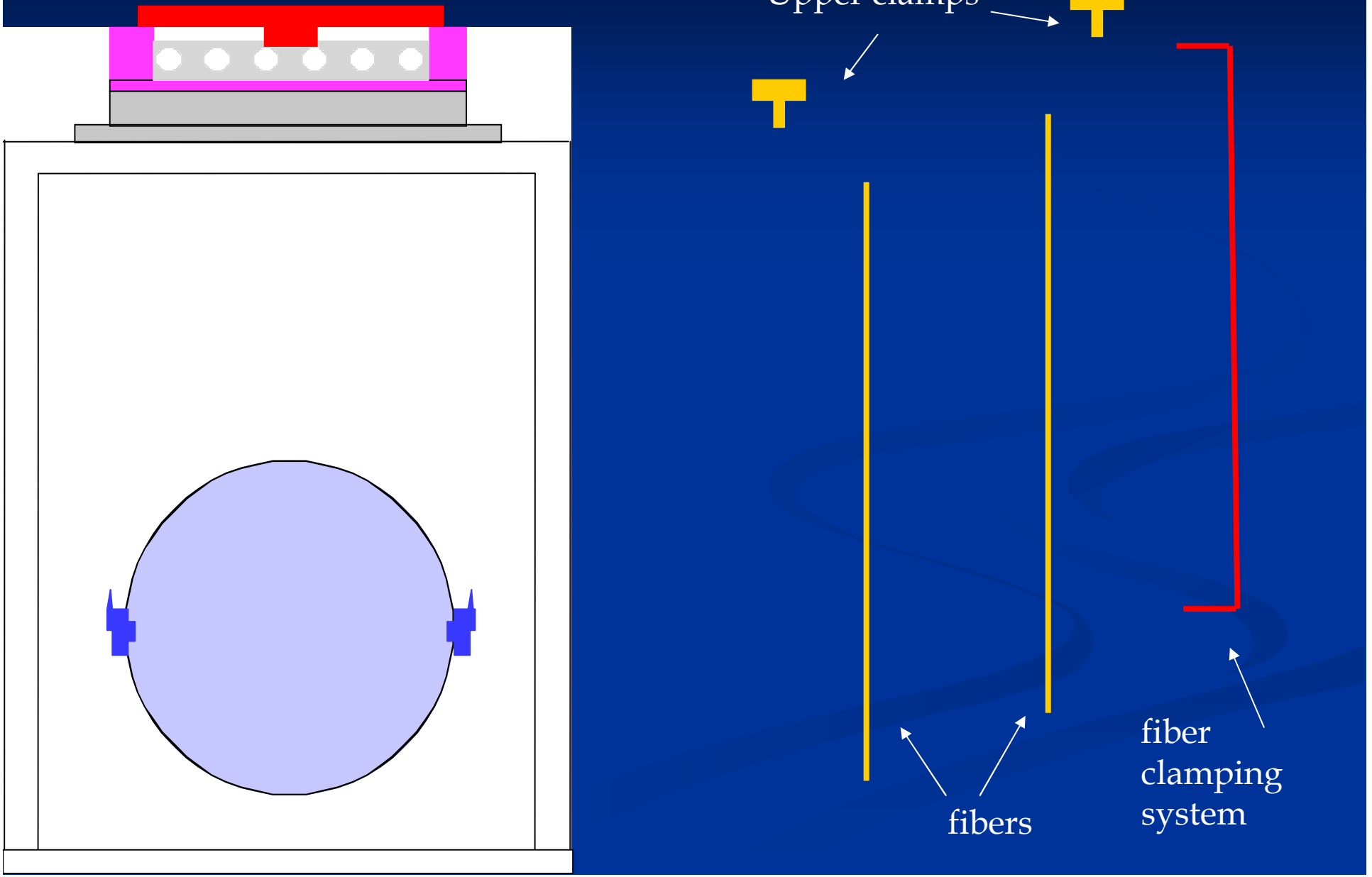


Dummy Mirror

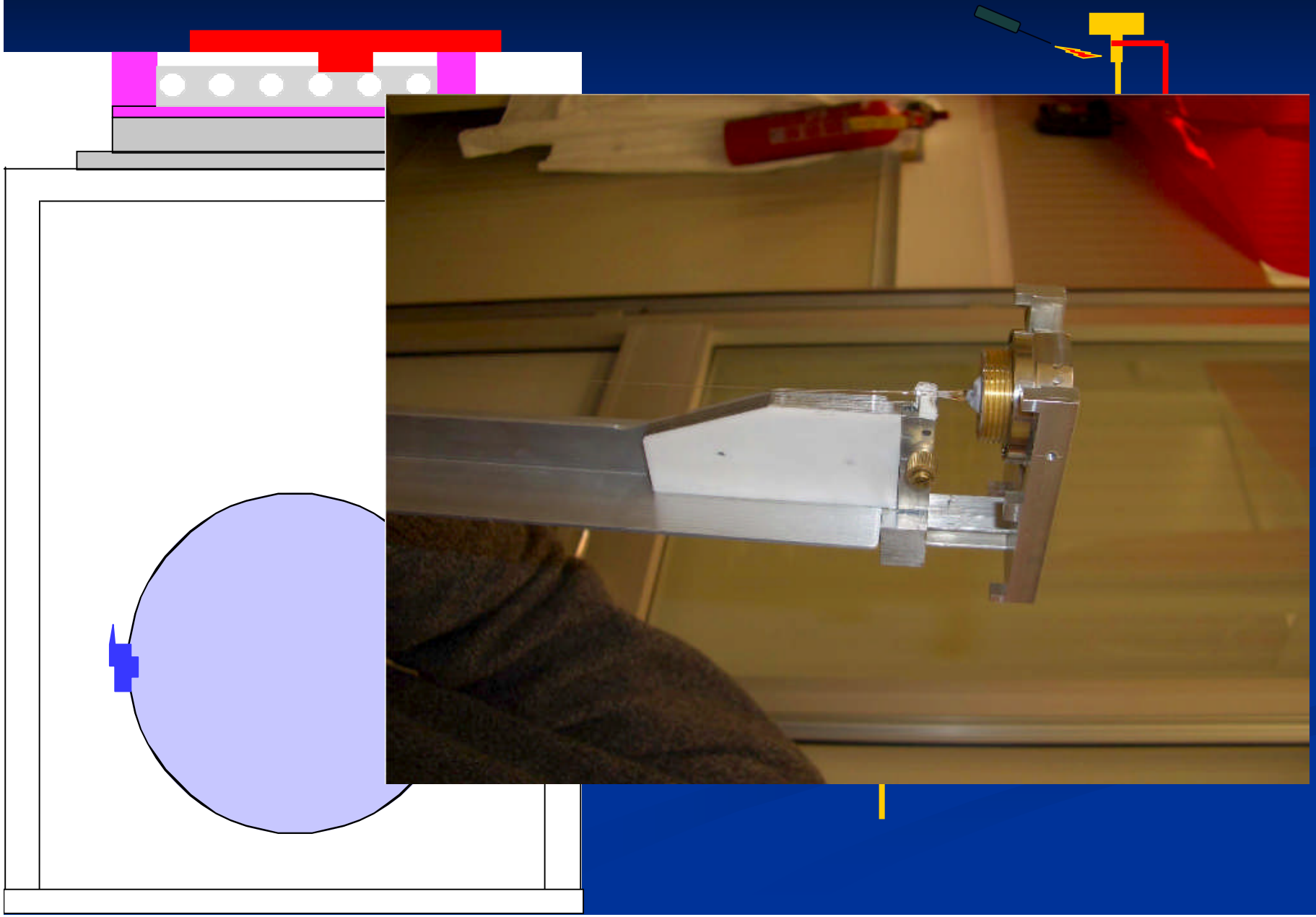
Slit to position the silica clamps above the mirror

Silica Fiber Clamps

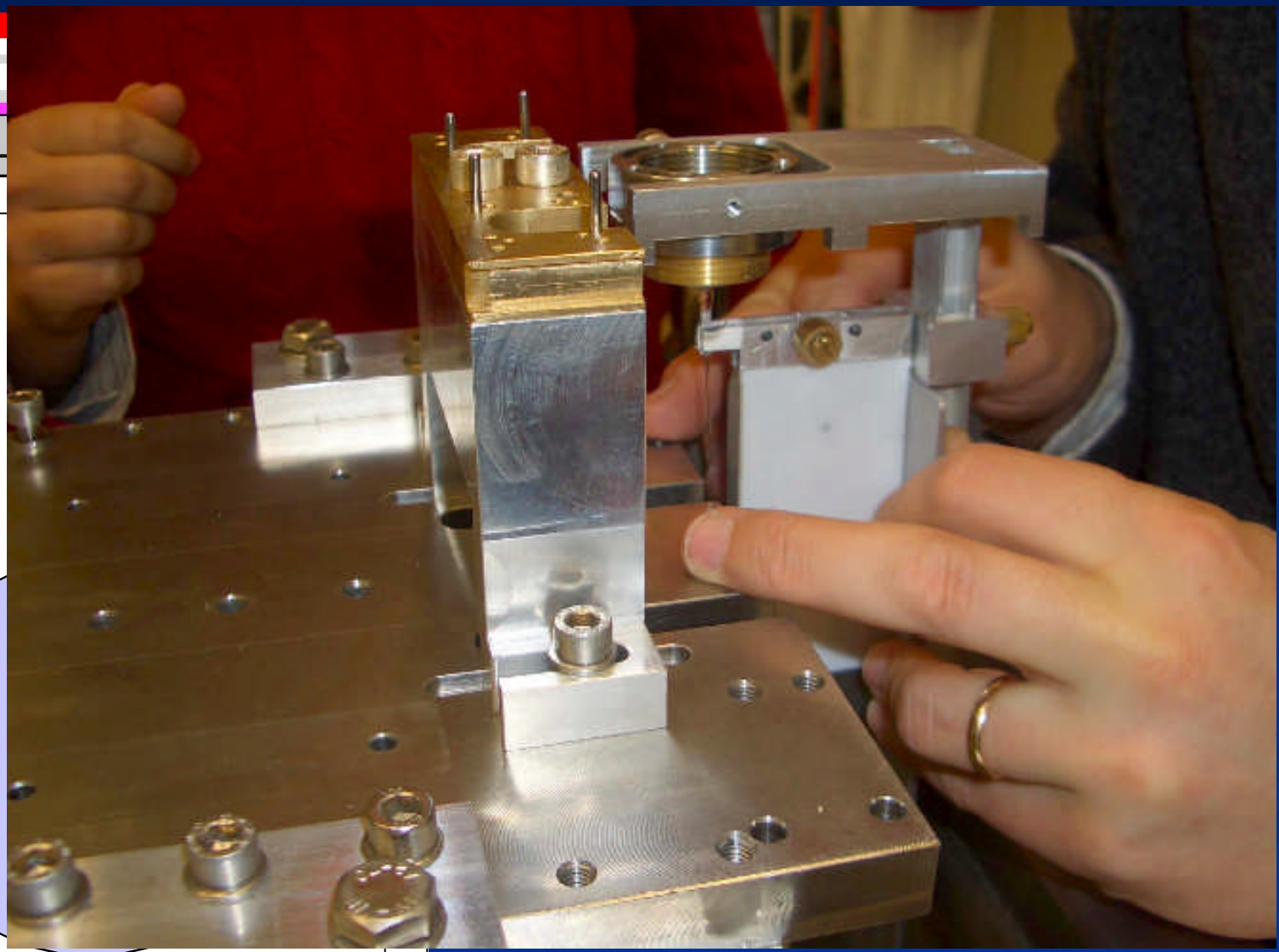
Procedure



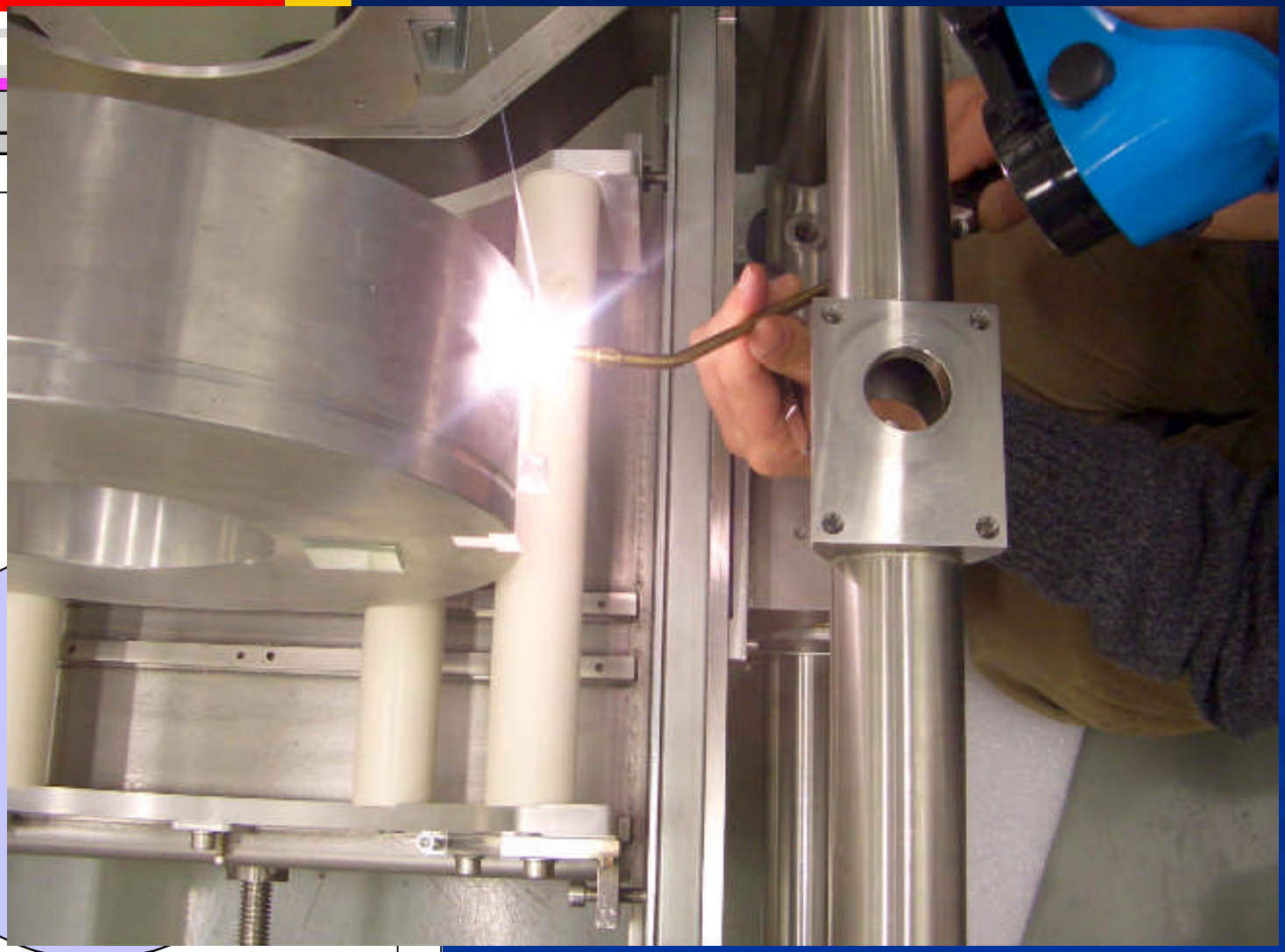
Procedure



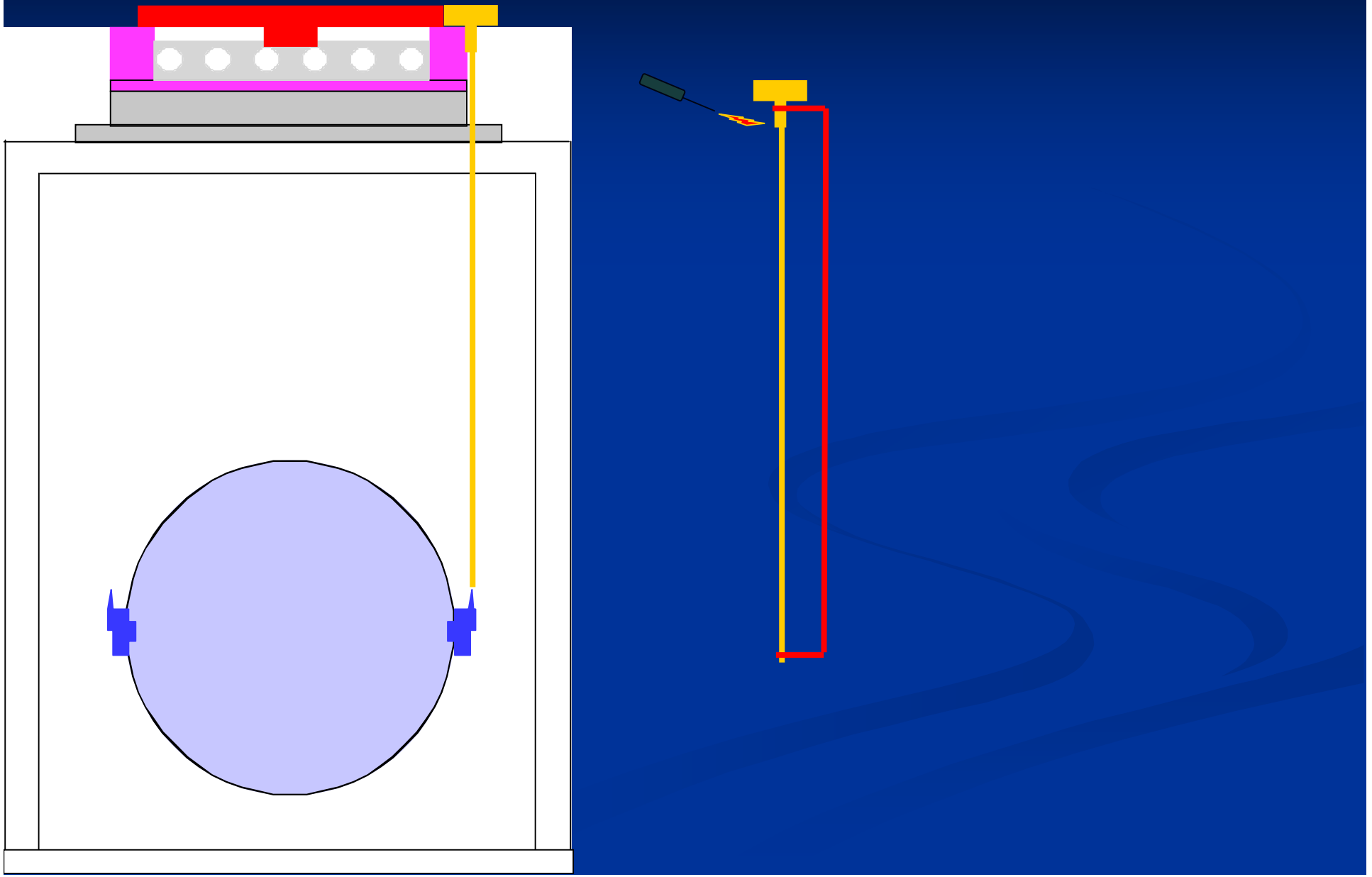
Procedure



Procedure



Procedure



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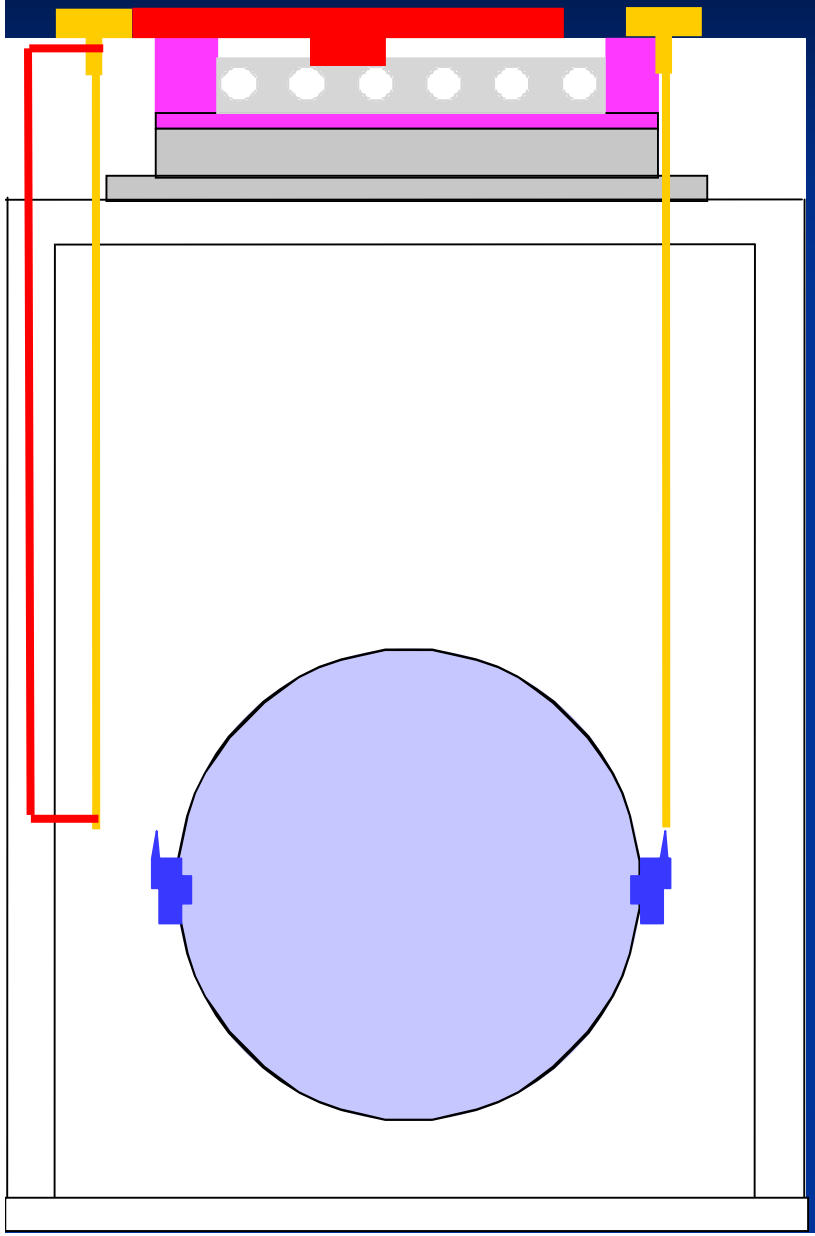
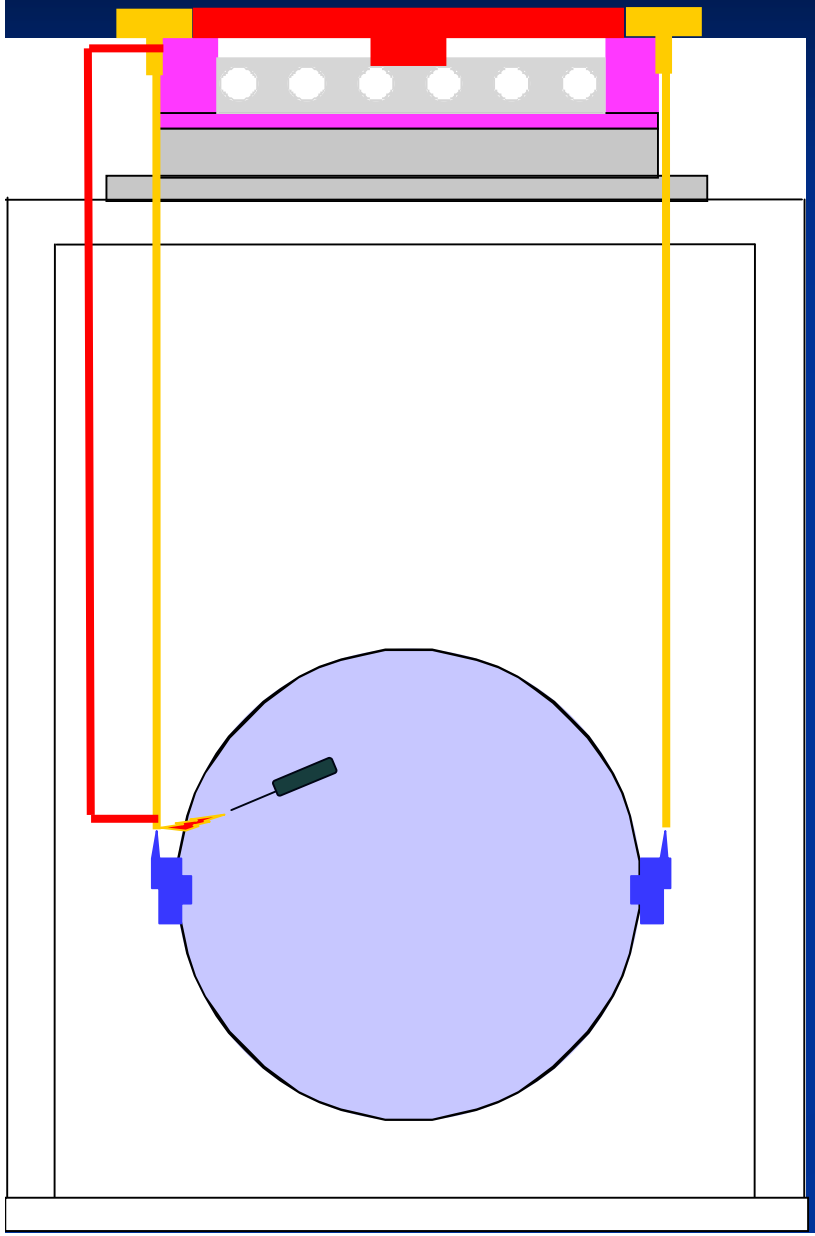
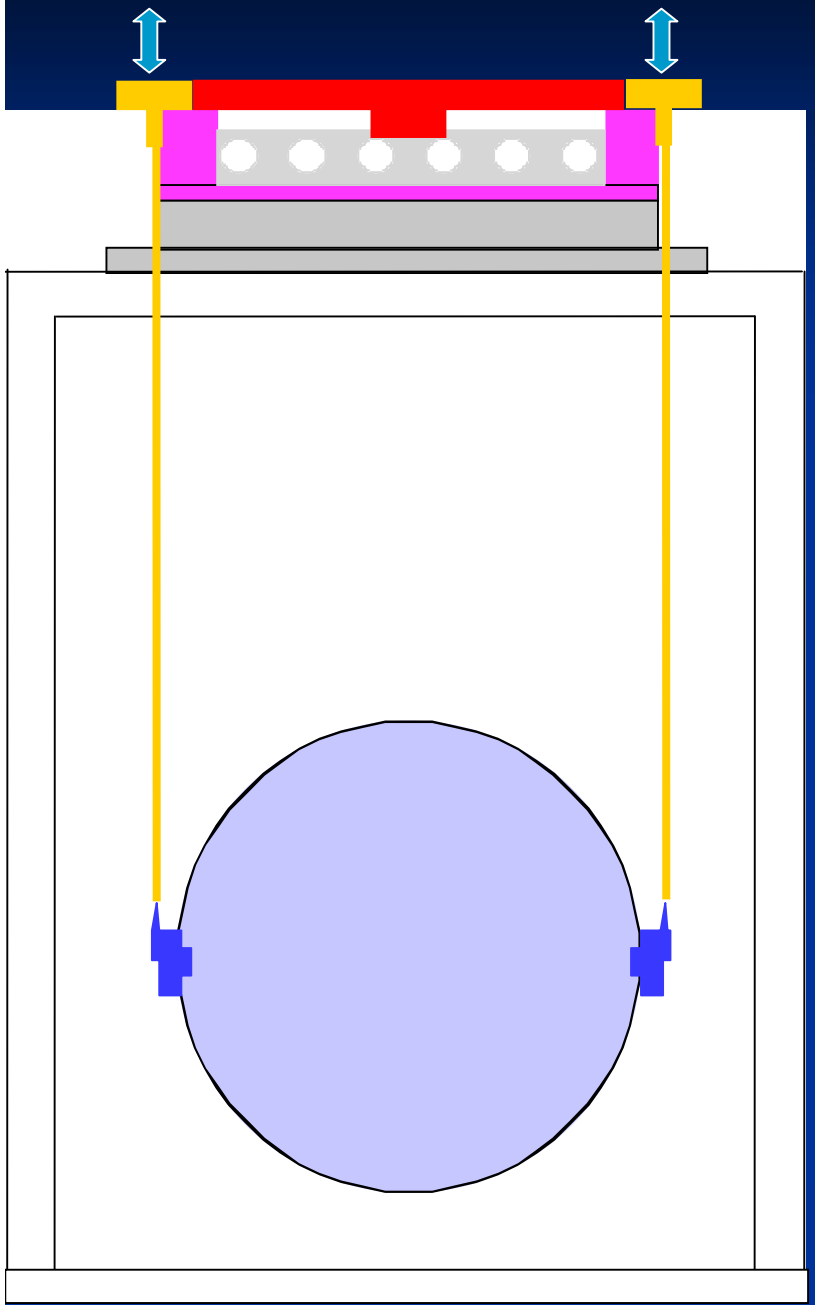


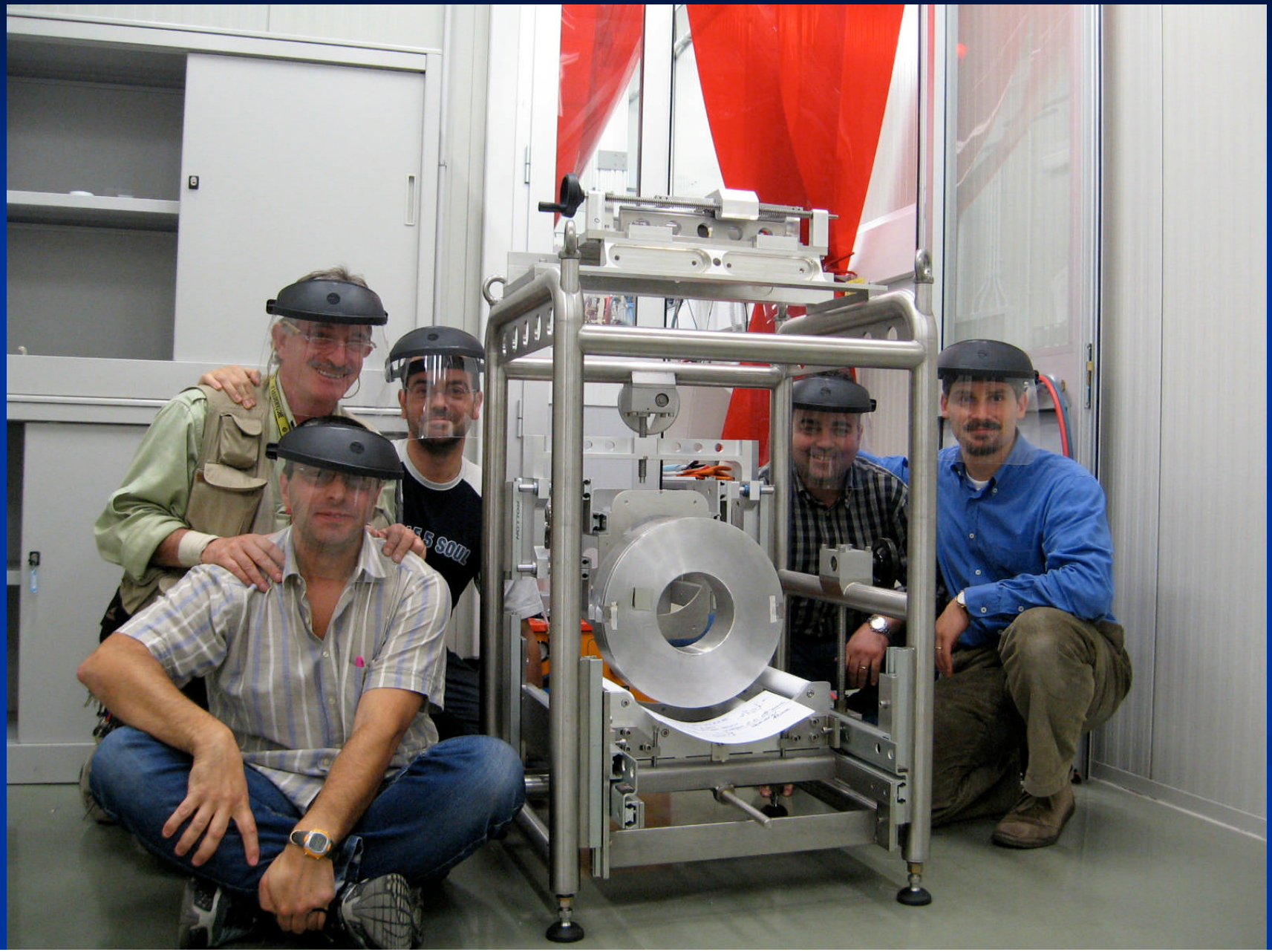
Procedure



Procedure



Et voilà…

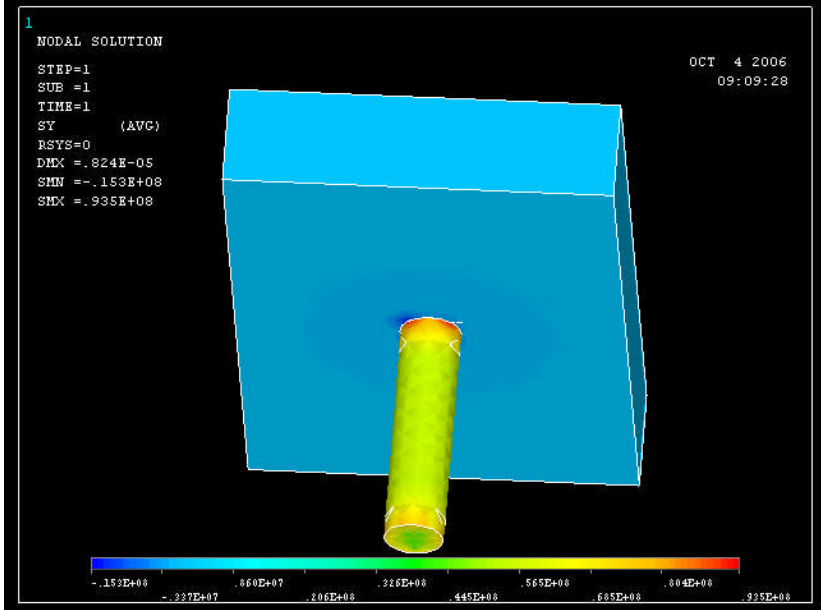


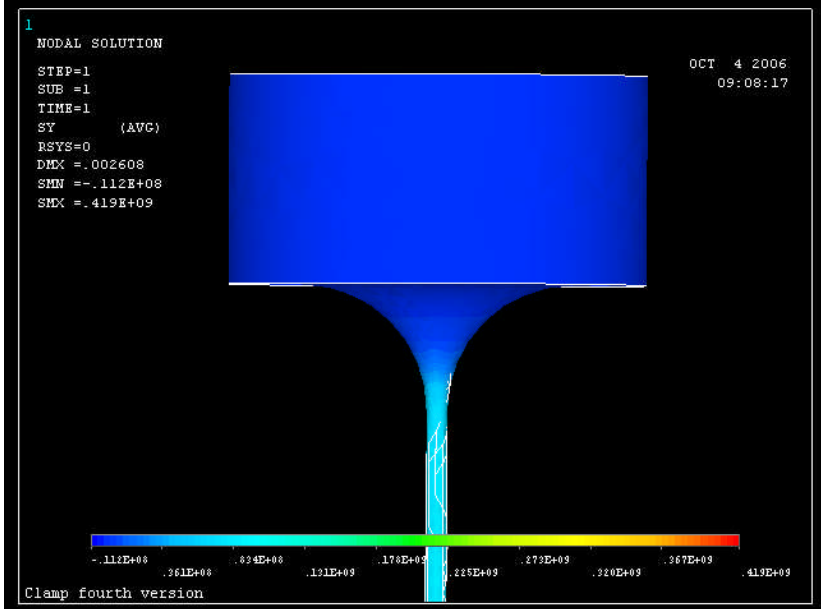
Next evolution:

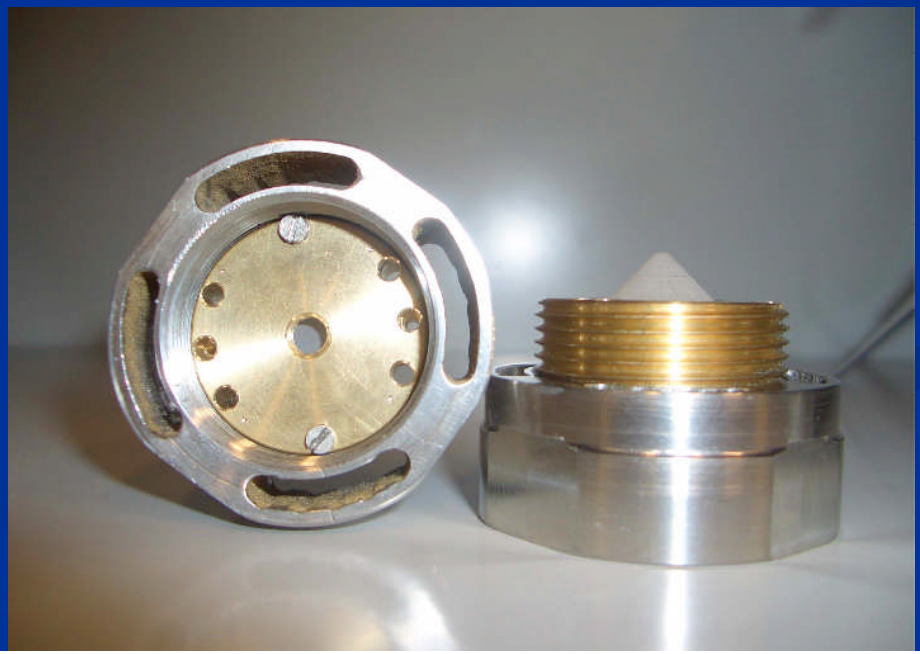
- *New upper clamp geometry has been tested;*

- *The lower ears has been changed to better control the positioning of the bending points;*

Stress comparison







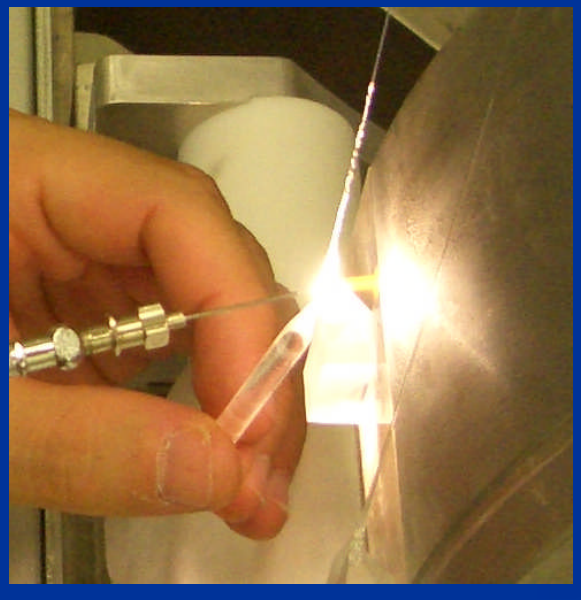
Ears geometry:

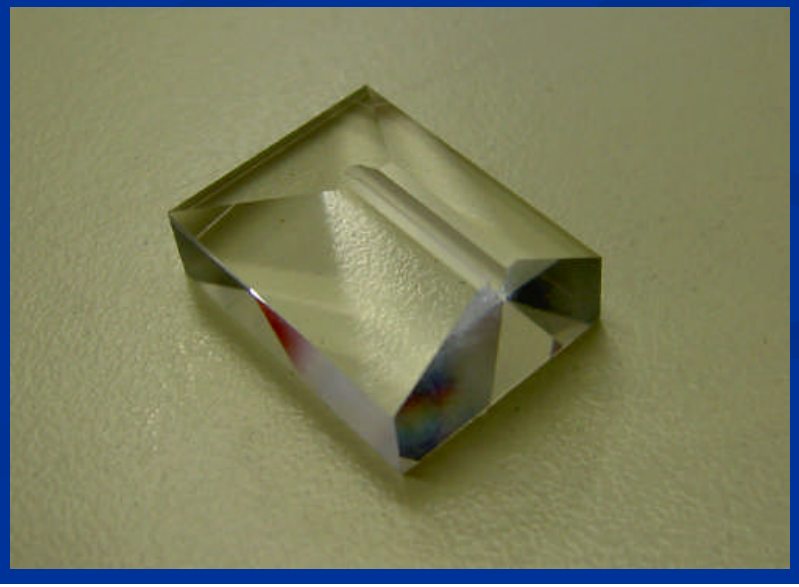
The lateral flats on the mirrors are centred and have a vertical dimension of 4 cm.

The bending point has to be fixed on the barycentric plane of the mirror:

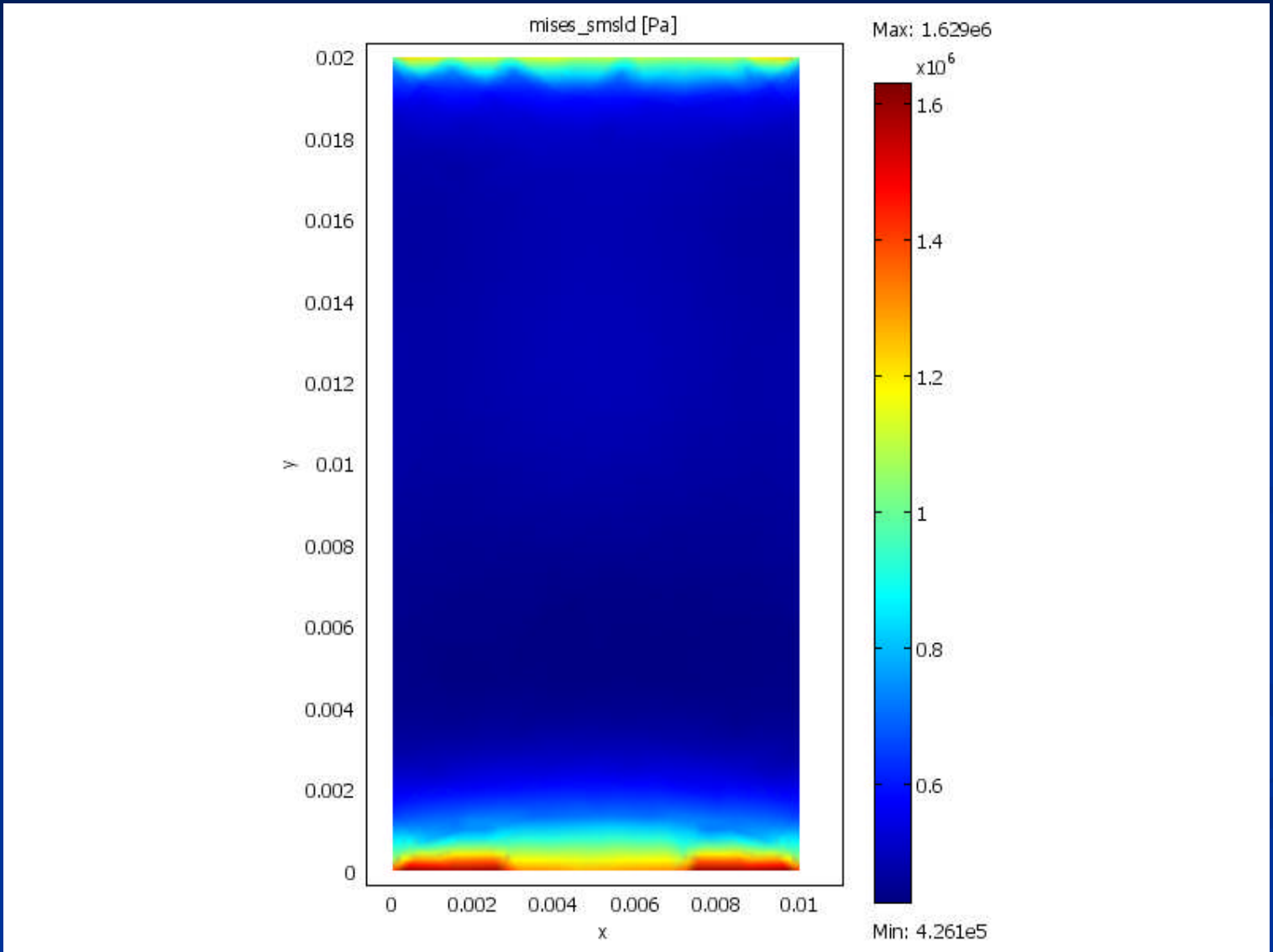
➔ *we have 2 cm below that point to be used for the bonding and the welding…*

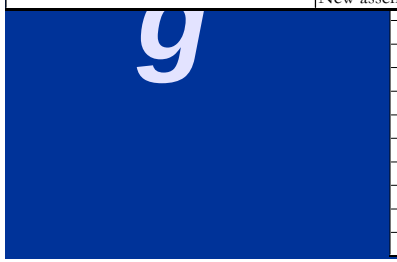
For this aim we tested a "lateral" welding on the fiber instead of the "tip-to-tip" one





Stress on the bonding surface:





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REALIZATION OF A STATIC SUSPENSION																				
Fibre production																				
H_2O_2 line																				
CO_2 line																				
Bending point machine																				
Upper clamp design and implementation																				
Lower clamping system design and implementation																				
Development and implementation of a dummy marionette																				
Suspension of a dummy mirror																				
Definition of the reference solutions and procedures																				
Development and design of a steel marionette																				
Development of a dielectric reaction mass																				
MECHANICHAL REALIZATION, RESPONSE CHARACTERIZATION AND CONTROL TEST																				
Realization of a steel marionette																				
Realization of a dielectric reaction mass																				
Assembly of a payload with a dummy mirror																				
Transportation test																				
Payload suspension																				
Local control facility implementation																				
Payload control and robustness test																				
READY FOR A DECISION																				
DEFINITION AND TEST OF THE MOUNTING PROCEDURES																				
Mirror preparation procedures																				
Payload assembling and transportation procedures																				
PRODUCTION AND INSTALLATION OF THE FOUR PAYLOAD COMPONENTS																				
Four mirror preparation																				
Preparation of the four marionette																				
Preparation of the four reaction masses																				
Mirror safety structure																				
New assembling structure																				
Bars, markers and magnets bonding																				
Fibre production and characterization																				
Preparation of the four marionette																				
Marionettes production																				
Marionettes assembling and cabling																				
Preparation of the four reaction masses																				
Coils and cables purchasing																				
Reference masses production																				
Reference masses cabling																				
Mirror safety structure																				
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Thanks for your attention!