



## Telescope installation of dichroic assembly

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### Change Record

Issue	Date	Section/ Paragraph Affected	Reasons / Remarks	Name
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## 1 Scope

This document describes the procedure of telescope installation of the ARGOS dichroic assembly. This includes also a section about how to prepare the mechanical interfaces between the telescope and the dichroic mount.

## 2 Applicable documents

No.	Title	Number & Issue
AD 1	ARGOS_FDR 015a dichroic	

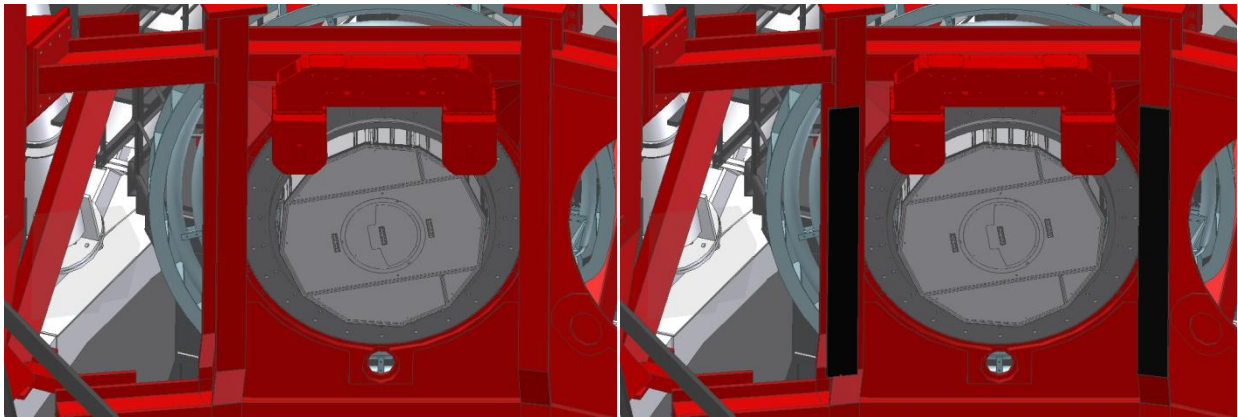
### 3 Introduction

The Argos dichroic will be installed in the LUCIFER focal station in front of the AGW unit. It will be bolted to the two lateral beams of the focal station. The dichroic mount will be removed every time a major maintenance will be needed by the primary mirror so we will have to provide a practical way to re-install the structure with sufficient accuracy.



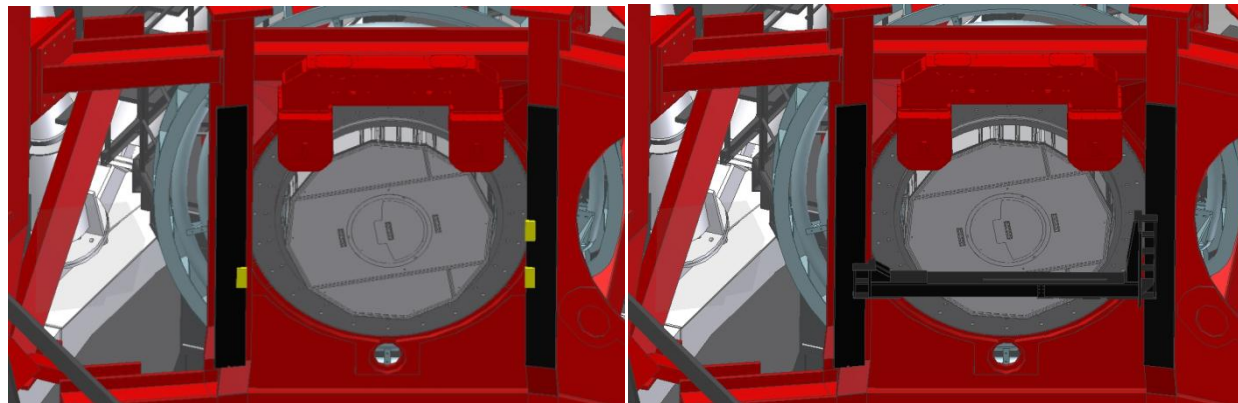
**Figure 1** AGW unit at the Lucifer focal station. Area occupied by the dichroic. Beams 1 and 2 indicated

The installation of the dichroic structure will face off two main problems both deriving from the fact that the interface surface where it will be bolted has not been constructed with this use in mind. In fact we expect to have problems both with the alignment and with the shape (roughness and planarity) of the surfaces of the two LBT beams.



**Figure 2 Comparison between the LBT 3D model and the position (in black) of the beams according to CAN document n° 650s003. There is a difference of approximately 19.5mm and .6° for beam 1 and 28.5mm and .73° between the model and the measurements. The design of the dichroic structure was done on the 650s003 model.**

The idea is try to regain the desired planarity and position by the insertion of thee shims bolted to the LBT structure. These shims will be secured with the interposition of chemical shims (or by machining the surface in contact with the beams to offer a three point support) in order to compensate for the heavy roughness of the surface and conveniently machined to compensate for misalignments of the beams. The shims are intended to be one-time a life installed and to became a part of the LBT structure. In this way we will create an interface flange to use, with the help of three pins, for a correct positioning and re-positioning of the dichroic.



**Figure 3The shims bolted in their places (right) and the dichroic beam secured to the shims.**

The installation procedure will be divided in four main phases:

1. Accurate measuring of the LBT beams surfaces (at least in the parts where the shims will be bolted)
2. Machining of the shims accordingly to the results of the measurement campaign
3. Installation of the shims, verification of the interface surface just generated in order to apply eventual minor corrections

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#### 4. Installation of the dichroic main beam

## 4 Interface between telescope and dichroic mount

The dichroic mount is critically placed between the AGW and the LUCI Calibration Unit. Based on the 3D model used for the design, there is a mere 5 mm tolerance on positioning of the structure. This is the reason that motivates an accurate measurement of the as built interface. The position of the interfaces has to be referred to the optical axis of LUCIFER and to the telescope components that are critically close to the dichroic structure, namely the AGW dodecagonal removable cover and the side of the LUCI calibration unit facing the AGW when the LUCI Calibration unit is in calibration position.

### 4.1 Measurement of the surfaces

In order to realize the shims we will need to measure the positions of three areas along the two LBT beams relatively to the front surface of the AGW unit. In particular we will need:

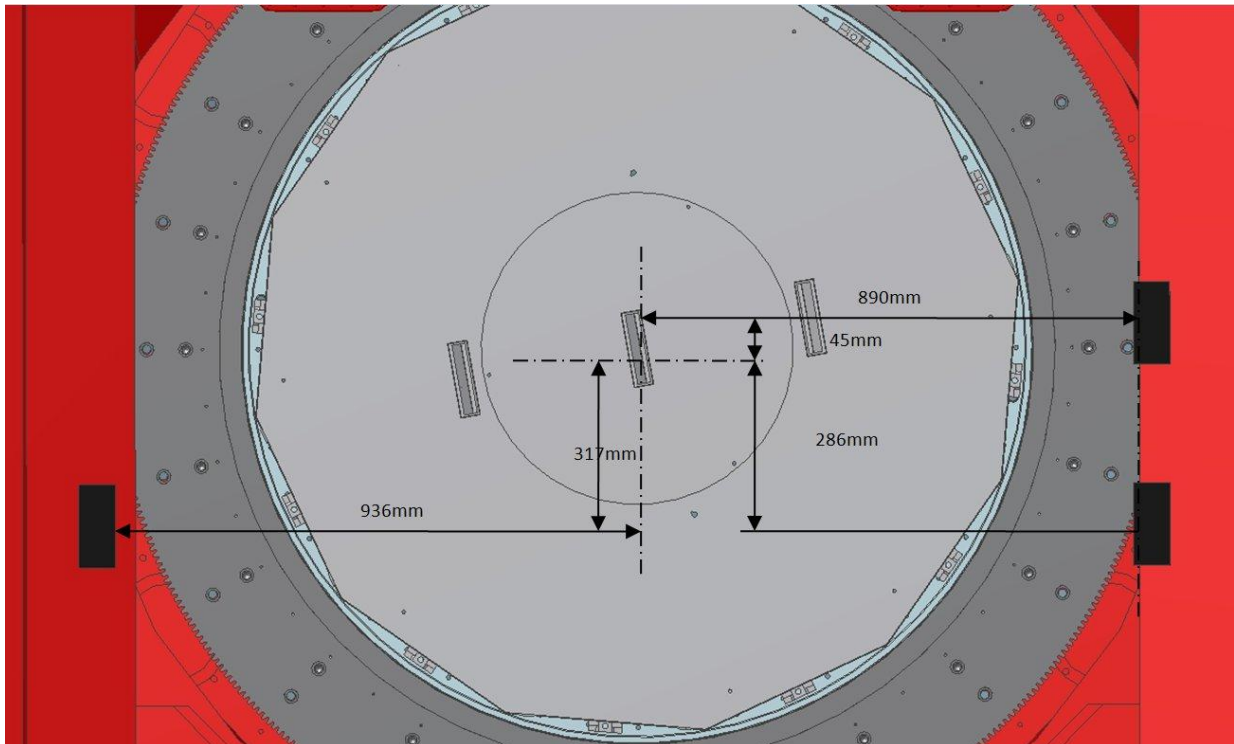
On beam 1 (see Figure 4):

an area 1 of 100 x 200mm centered at -936, -317 mm from the optical axis of LUCIFER

On beam 2:

an area 2a of 100 x 200mm centered at 890, 45 mm from the optical axis of LUCIFER

an area 2b of 100 x 200mm centered at 890, -286 mm from the optical axis of LUCIFER



**Figure 4 Area where the shims will be bolted to the rotator gallery**

For the forementioned areas the coordinates should be given in a sistem with the XY plane correspondent to the front surface of the AGW unit and the 0 located on the optical axis of LUCIFER Z positive toward M1.

We think this could be the right moment to realize the holes on the beams. A total of 6 holes should be realized (4 on beam 2 and 2 on beam 1 with a desirable precision of at least  $\pm 1$ mm). Their real position should be given along with the surface measure.

## 4.2 Shims production

According to the measurements a model of the correcting surfaces will be generated and realized at Arcetri facilities by CNC machining.

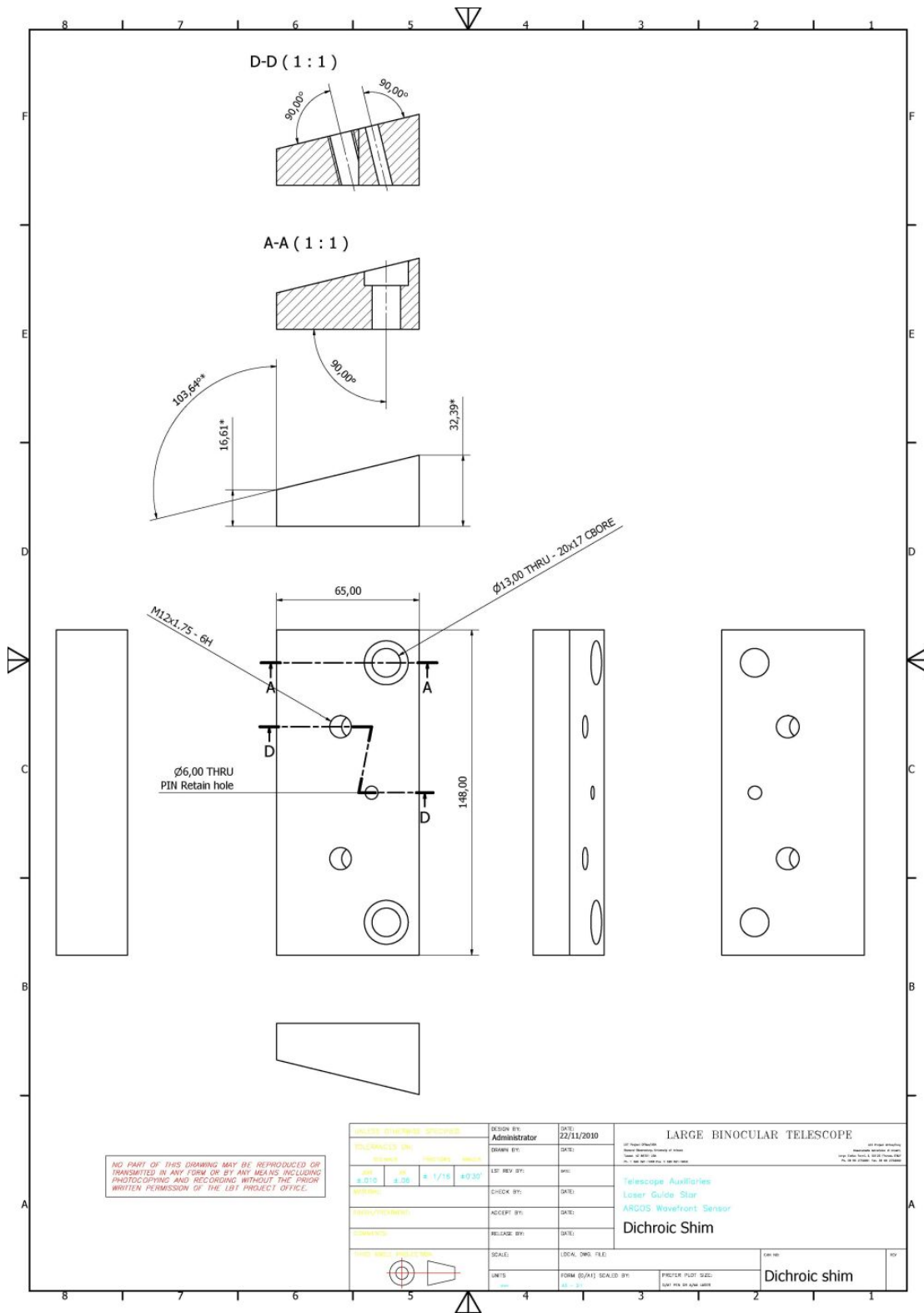
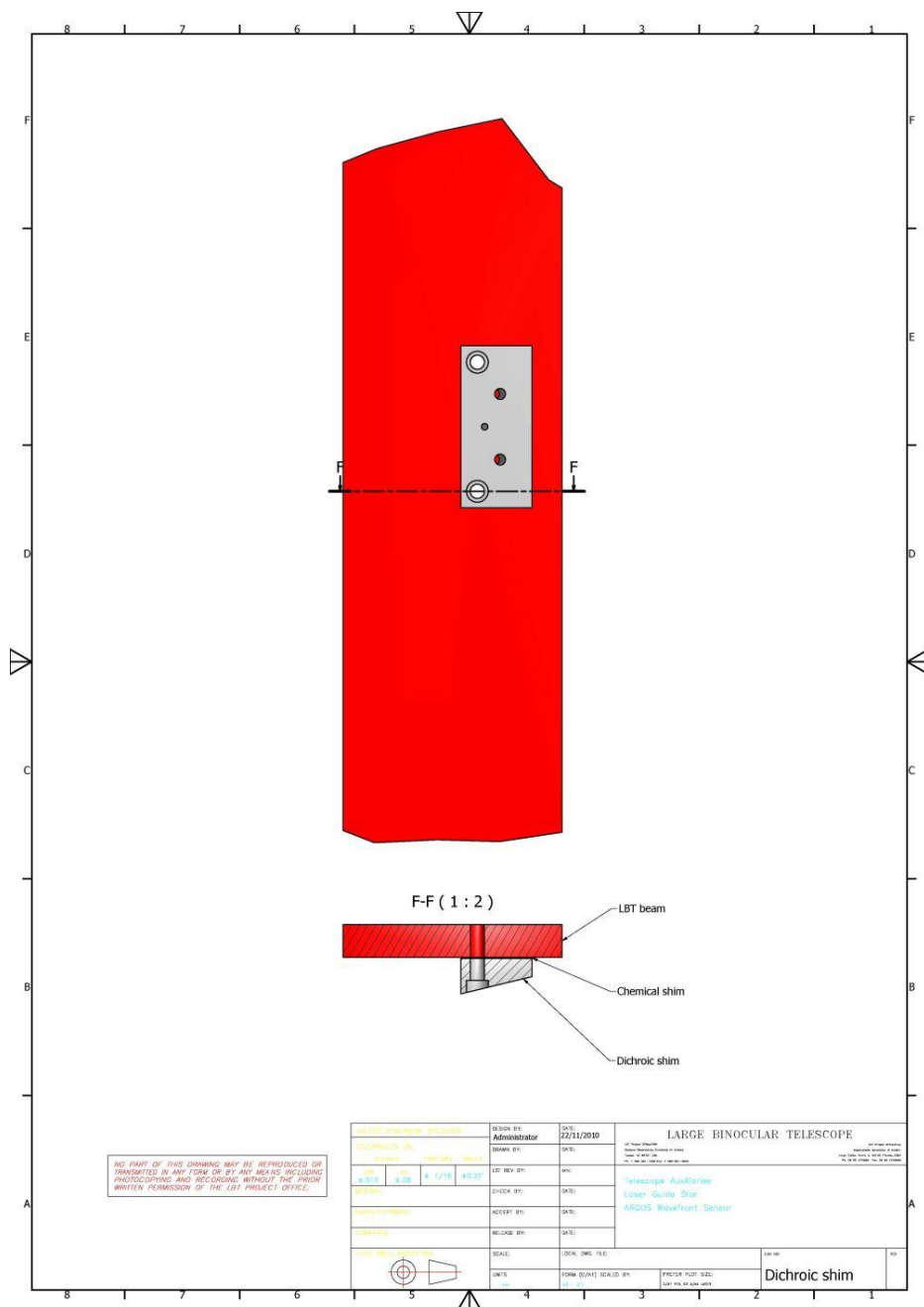


Figure 5 Technical drawing of the shims

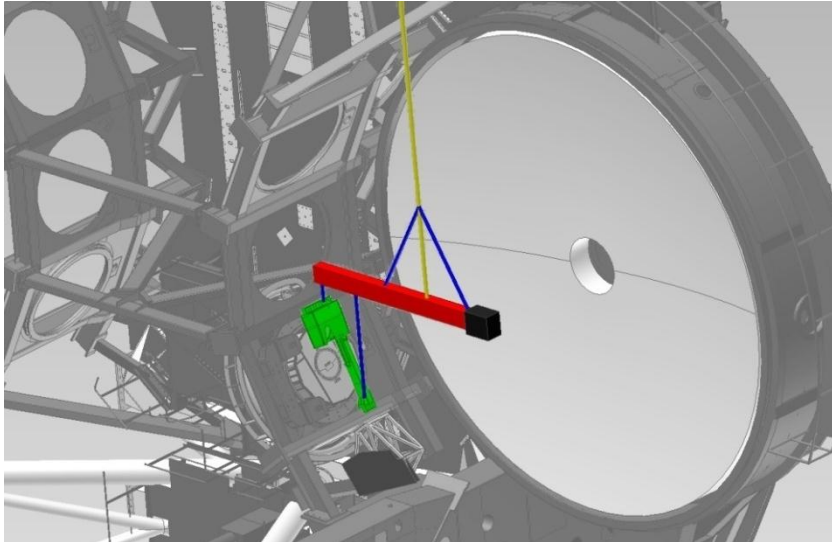
### 4.3 Installation of the shims

As a first step (and before the dichroic reaches the mountain for the summer shutdown) we will install the shims on the LBT structure. Each shim will be bolted at the structure by two 12mm passing bolts using the pre-drilled holes. With the three shims in place a set of measurement will be taken to verify the correct positioning and shape of the interfaces. Little adjustments could be realized by remachining the surface using the LBTO facilities (in case of major differences from the desired conditions), or by shimming and letting the epoxy shim dry.

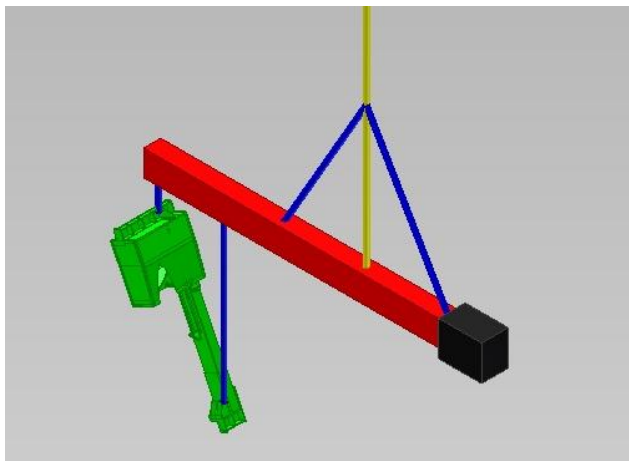




## 5 Installation of the dichroic beam



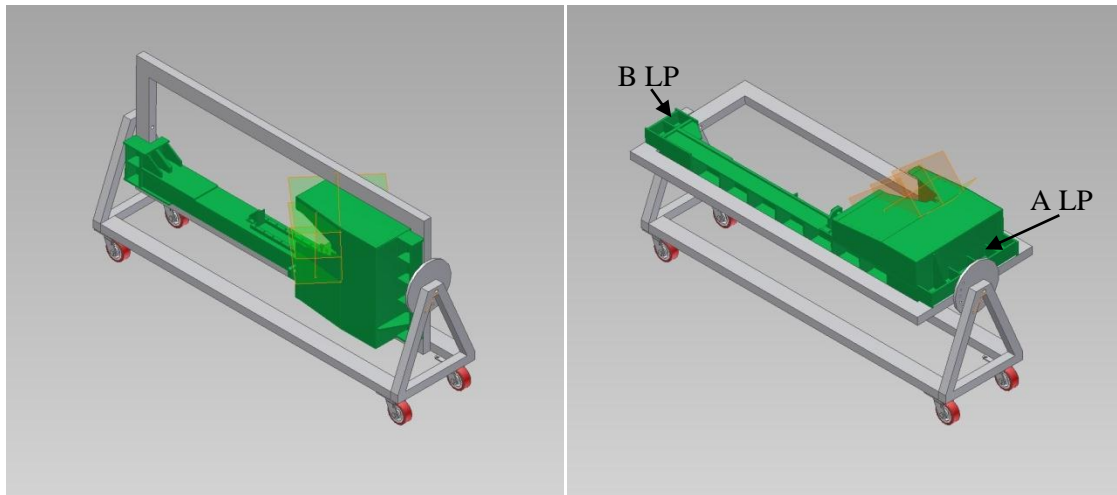
The installation of the dichroic beam will imply the use of the LBTO dome crane and of a special tool designed for moving the dichroic structure maintaining the correct mounting angle and position and avoiding the telescope structure. It consists essentially of a beam and a series of chains of the right dimensions to achieve the correct inclination of the dichroic mount. A counterweight helps in reducing the length of the beam while permitting the off axis positioning of the dichroic needed to mount it without chock with the telescope structure.



**Figure 5: Dichroic moving set up. Colors are used to identify the various parts: in Green the dichroic itself- Yellow for the main link to the dome crane-Red for the beam-Black for the counterweight and Blue for the chains.**

## Pre-installation items:

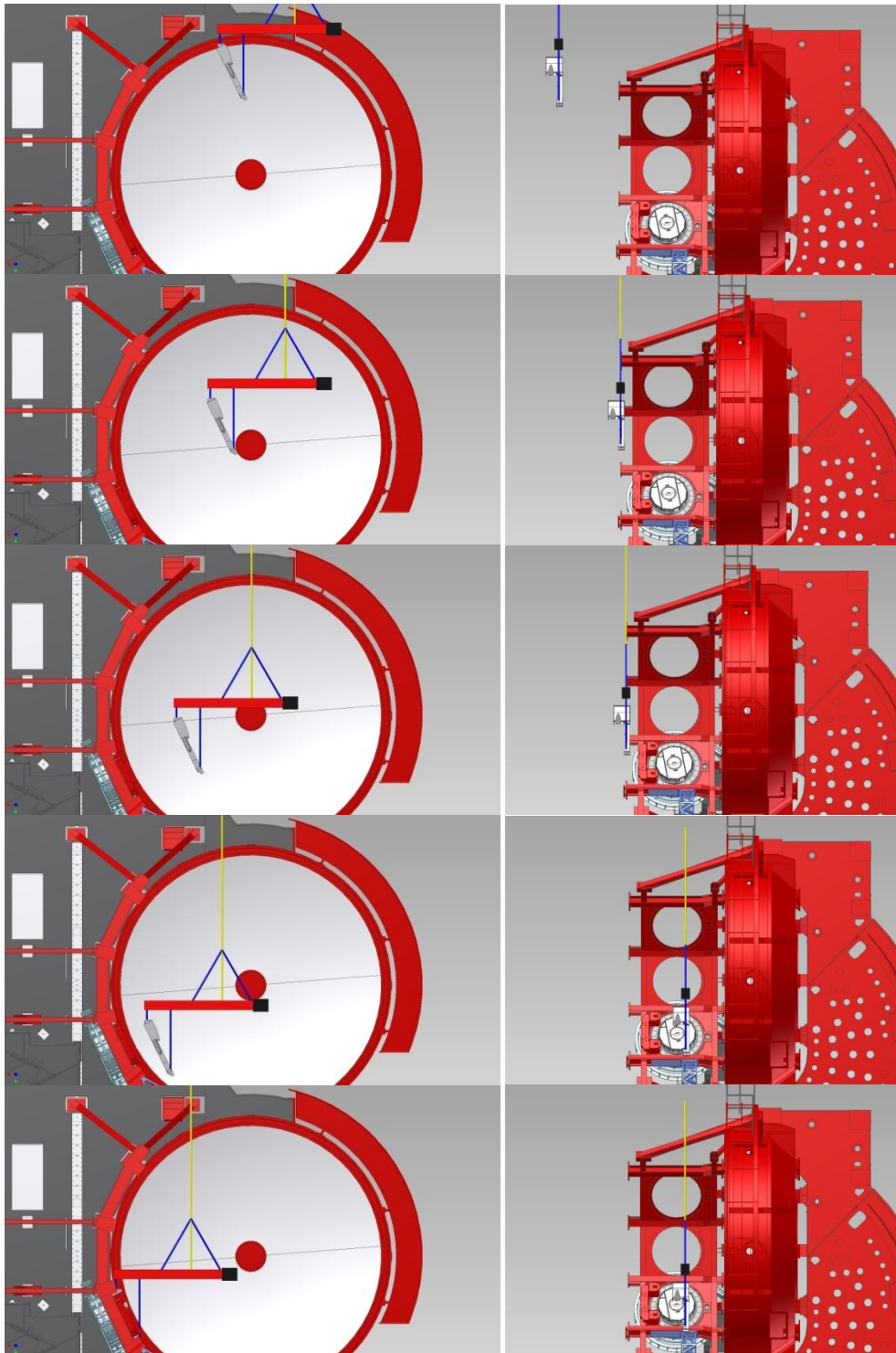
1. The dichroic cove must be in place( or the dichroic must be removed from the frame)
2. The dichroic frame must be in “park” position and blocked.
3. The dichroic mount must be placed on the handling carriage in horizontal position.(Fig 6).
4. The telescope will be pointed at the horizon and all the swing arms retracted.
5. The dichroic shims are mounted and verified.



**Figure 6: Dichroic Handling carriage in vertical position for test and in horizontal ready for being lifted.**

## Installation sequence:

1. The beam complete with the counterweight is hanged to the crane and secured. The crane is lifted to the height of the shorter chain
2. The handling carriage is placed below the crane.
3. The dichroic is unbolted from the Handling carriage.
4. The short chain is secured to the A lift point of the dichroic
5. The long chain is secured to the B lift point of the dichroic
6. The crane is lifted of a little amount in order to verify the correct angle of the dichroic (using an inclinometer) and to check connection and cables for the movement.
7. The carriage is removed
8. The dichroic is lifted to the dome and, following the path illustrated here below, placed in its installation position.
9. The dichroic is bolted to the shims using the pins as reference for the correct positioning
10. The chains are un... from the LPs.
11. All the cables are connected
12. The dichroic cover is removed (The Dichroic is installed back)
13. The dichroic frame is unblocked
14. The installation is ended.





## 6 Alignment of the dichroic (????)

**End of document**