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Concepts for the Gold Barrel Sleeve for both the ETM  
and TCP Optics

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Distribution of this document:  
Inform `aligo_sus`

This is an internal working note  
of the Advanced LIGO Project, prepared by members of the UK team.

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## 1 Introduction

The purpose of this document is to serve as a record of the concepts for the proposed Gold Barrel Sleeve and the required additions to the lower structure face plates used in the ETM suspensions supplied by RAL.

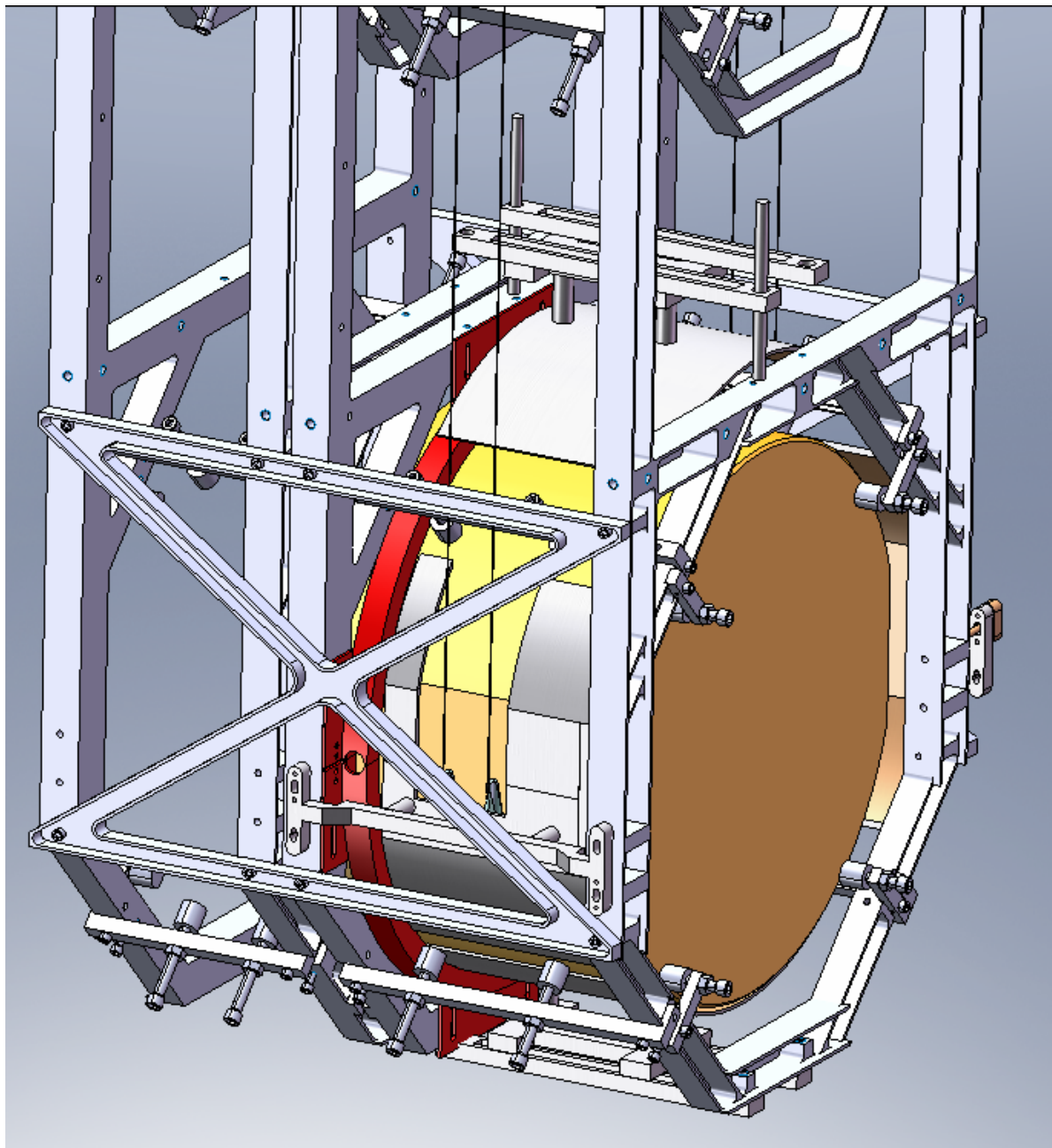


Figure (1): - Two sections of the proposed Gold Barrel Sleeve shown around the ETM

## 2 General description of the interface

At present we have 2 concepts for the Gold Barrel sleeve.

The first would have 4 sections which will be located and interface as follows: -

- on the barrel of the optic (top and bottom) using the holes freed up by the removable clamps "Joe's saddles", LIGO D060566. It is also assumed that the "PTFE 440" clamps, LIGO D060457 and LIGO D060446, will be removed.
- on each side of the barrel adjacent to the fibres and ears interfacing with "new" holes in the lower structure (both sides)

The second would have 5 sections which will be located and interface as follows: -

- on the barrel (top and bottom) as above
- on the back side of the optic barrel modifying the design of the ring heater
- on each side of the barrel, as above

From private communications with both Russell Jones and Amanda Brummitt, I positioned the test mass optic wrt the lower structure.

- The distance in X (parallel to the optical beam) between the front face of the optic and the back side of the front face plate is 2.5 mm (with gap)
- The vertical distance in Z from the bottom of the lower structure to the centre of the optic in its suspended state is 216.7 mm (- 2 mm + 0 mm)

### 3 Request

We are asking RAL to consider adding an additional 4x 8-32 tapped holes with appropriate material and Heli-coils to each of the 2 face plate designs, LIGO-D060434 and LIGO-D060462, refer to section 6 below. (The numbers in section 6 are 40 mm and 70 mm from end of the flat section of the face plate, as shown.)

Please find the step file called D060040\_SILICA TEST MASS ASSEMBLY WITH RING HEATER ASSEMBLY-00.STEP is attached.

The addition of these holes will allow us to consider using a gold sleeve for both the main chain (ETM) and reaction chain (TCP). We are aware that it may not be possible to add these additional holes to the training structure.

Reply

Calum,

Drawings LIGO-D060462-C and LIGO-D060434 are updated for the additional hole for the barrel. These are now released to the manufactures.

Let me know if you require anything further from me.

Regards

Amanda J Brummitt

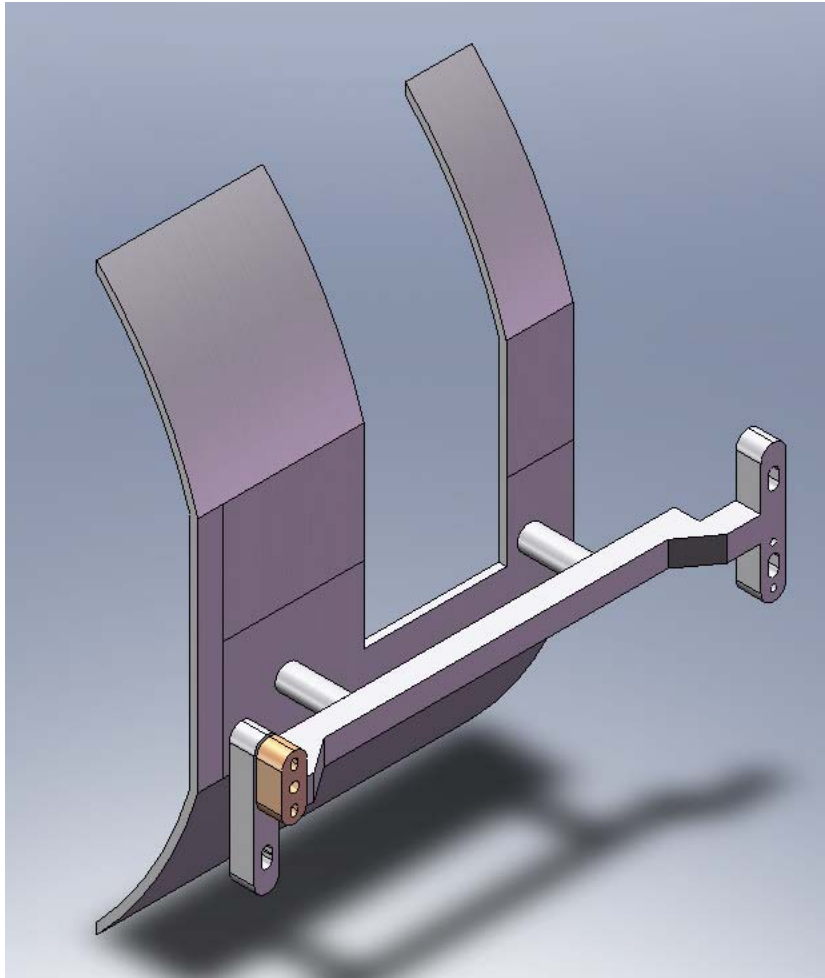
Mechanical Design Engineer

### 4 Assembly Procedure

I have considered the assembly procedure for the 4 sectioned barrel sleeve. As mentioned above the design assume that the "saddles" and "PTFE 440 clamps" will be removed prior to installation. It also assumes that the holes freed up by the "saddles". Before the side sleeve sections are added the X brace must be removed and re-attached afterwards. The concept side barrel sleeve has a vertical adjustment.

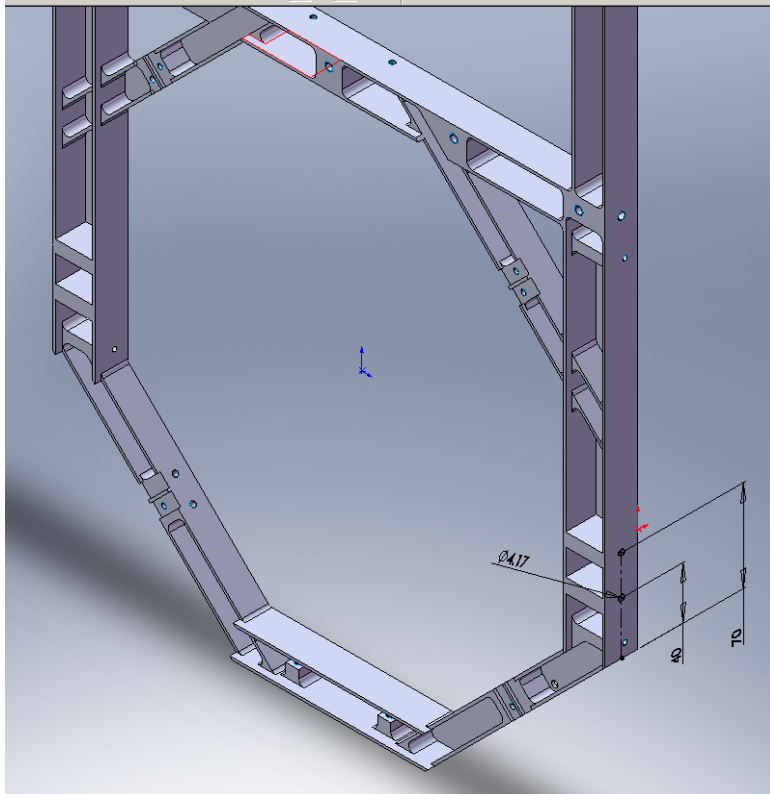
## 5 Barrel Design

One of the sections is shown below.

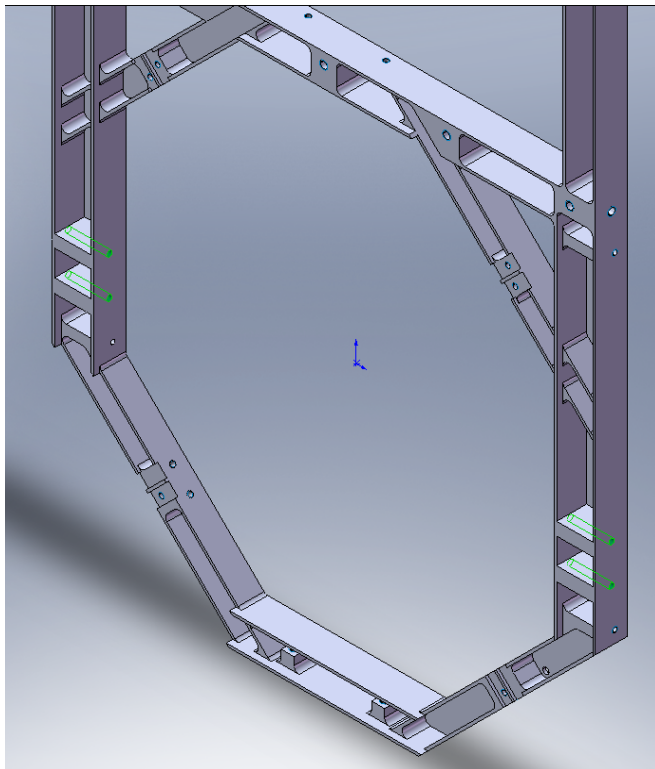


To Do: - add pictures of other sections and link to concept drawings

## 6 Drawing reference



It is assumed that these 4 additional holes will be added to each of the 2 face plates making up the lower structure (2x D060434 and 2x D060462).



## 7 Interface with suspension

After much consideration we believe that although hard that this installation is possible. One item we would like to emphasise is that the area around the ears and fibres should be considered a no go area for any part of the sleeve, reference figure below.

Figure (XX): To Do: - add picture

The areas adjacent to the earthquake stops should also be no go areas for the barrel. Otherwise suspending and re-suspending (after a repair) would be made difficult.

Figure (XXX): To Do: - add picture

I have requested 10 mm as the gap between the optic and the inside of the barrel in all locations. (This may have to be as close as 5mm.)

## 8 Barrel Layout

To do: - Create cross section of the barrel indicating the coverage offered by both concepts