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|  | | ASTRI Mini-Array Astrofisica con Specchi a Tecnologia Replicante Italiana | | | | | |
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M2 Interface Control Document



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| DOCUMENT HISTORY | | |
|------------------|------------|---|
| Issue/Revision | Date | Modification |
| 1.0 | 10/01/2020 | First release |
| 1.1 | 19/10/2020 | Changed to comply with the general document scheme for the ASTRI Mini-Array project |
| 1.2 | 22/20/2020 | Modified section 3.1.1 and figure 7 with the updated design |

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1 Introduction

The ASTRI Mini-Array is an INAF project aimed to construct, deploy and operate a set of 9 Cherenkov telescopes of the 4 meters class at the Observatorio del Teide in Tenerife (IAC, Spain). The ASTRI Mini-Array will observe astronomical sources emitting at very high-energy in the TeV spectral band.

1.1 Purpose

This document is the Interface Control Document regulating the hardware interface between the ASTRI Mini-Array telescope and the secondary mirror. The mirror will be delivered to the ASTRI telescope contractor by INAF.

1.2 Scope

This document describes the mechanical interface of the M2 mirror to the ASTRI telescope.



1.3 Content

Section 3 describes the mechanical interface between the M2 mirror and the telescope.

1.4 Definitions and Conventions

1.4.1 Abbreviations and acronyms

| | |
|-------|--|
| ASTRI | Astrofisica con Specchi a Tecnologia Replicante Italiana |
| IAC | Instituto de Astrofisica de Canarias |
| INAF | Istituto Nazionale di Astrofisica |
| M2 | ASTRI Mini-Array Telescope secondary mirror |

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2 Related Documents

APPLICABLE DOCUMENTS

| | | |
|-------|---|------------------------------------|
| [AD1] | p2678_rep3_Issue_2.pdf Prototype – WP2.1 Structural Analysis | ASTRI Project design of M2 for SST |
| [AD2] | D3126-000-00-00VP3 | M2 support |
| [AD3] | ASTRI-INAF-DWG-7222.100-01 | M2 Axial inner pad |
| [AD4] | ASTRI-INAF-DWG-7222.200-01 | M2 Axial outer pad |
| [AD5] | ASTRI-INAF-DWG-7222.310-01 | M2 Tangential support pad |
| [AD6] | ASTRI-INAF-DWG-7222.320-01 | M2 Tangential support pad |

REFERENCE DOCUMENTS

| | |
|-------|---|
| [RD1] | ASTRI-DES-GEC-3100-027c – ASTRI Telescope Mechanical Design Description |
|-------|---|

3 M2 Interface Control Document

3.1 Mechanical Interface

The mechanical interface of the M2 mirror provides the connection between the mirror itself and the M2 support system. Where:

- the mirror will be manufactured by INAF on the “solid configuration” described in section 3.2 of p2678_rep3_Issue_2.pdf;
- the M2 support system will be provided by EIE as described in D3126-000-00-00VP3.pdf.

The M2 mirror is a thermally bent-to-shape monolithic plate of borosilicate glass having a constant thickness of 19 mm and an outer diameter of 1845 +/- 5 mm.

The M2 mirror comes with the proper mechanical interface already glued to the backside of the mirror itself. The interface is composed by 12 metallic pads, the layout is shown in Figure 1. The location of the pads is on a circle centred on the centre of the M2 mirror:

- 3 pads are placed at $R = 270$ mm (axial inner pads);
- 6 pads are placed at $R = 645$ mm (axial outer pads);
- 3 pads are placed at $R = 720$ mm (tangential support pads).

The pads are made in stainless steel type AISI 304.

The mechanical drawing of the pad is provided in ASTRI-INAF-DWG-7222.100-01.pdf, ASTRI-INAF-DWG-7222.200-01.pdf, ASTRI-INAF-DWG-7222.310-01.pdf, ASTRI-INAF-DWG-7222.320-01.pdf.

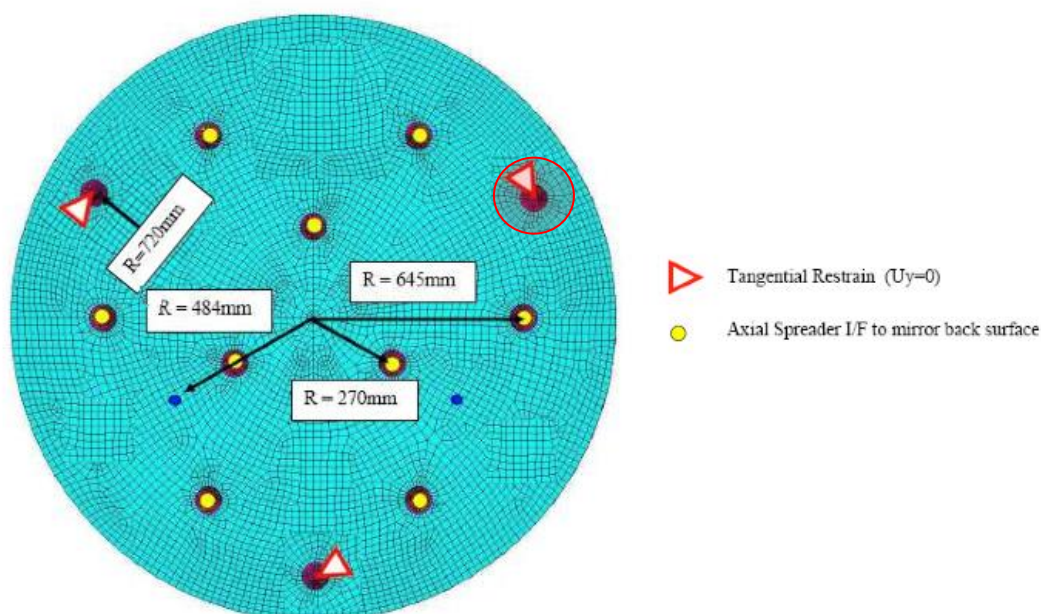


Figure 1. Location of the interface pads between the M1 mirror segment and the M1 segment support triangle. The red circle shows the position of the tangential pad with different orientation of the interface holes (see section 3.1.3)

3.1.1 Axial inner pads

The mechanical design of the 3 identical axial inner pads mounted at a radial distance of 270 mm from the mirror centre is given in Figure 5.

3.1.2 Axial outer pads

In order to have the 6 axial outer pads all identical one to each other, it is requested to rotate the screws/holes that interface the axial outer pads with the load spreaders by an angle of 30° . This allows maintaining the wedged in radial direction interfacing the Cartesian disposed load spreader holes.

The concept is sketched in Figure 2. The mechanical design of the 6 axial outer pads mounted at a radial distance of 647 mm from the mirror centre is given in Figure 6.

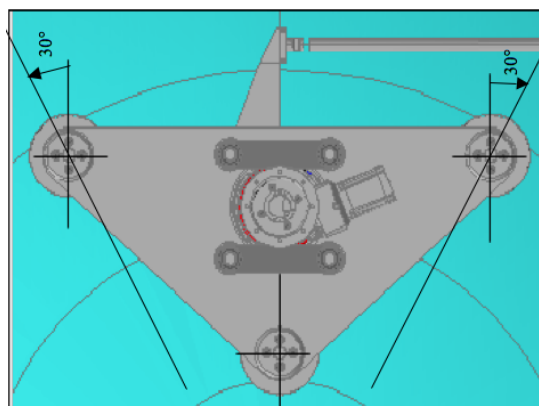


Figure 2 Rotation of the axial outer pad interfacing the load spreaders.

3.1.3 Tangential support pads

The tangential support pads are not identical: the screws/holes that interface the tangential rods with the M2 Support Structure are rotated respect to the top surface of the pad by an angle of 18.9° (see *Figure 3*) for two out of three pads and of -18.9° for the remaining one.

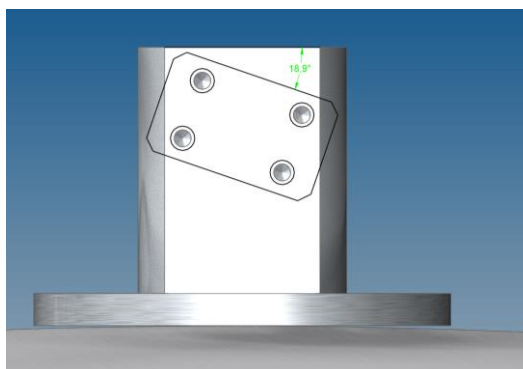




Figure 3. Rotation and dimensional change of the tangential support pads.

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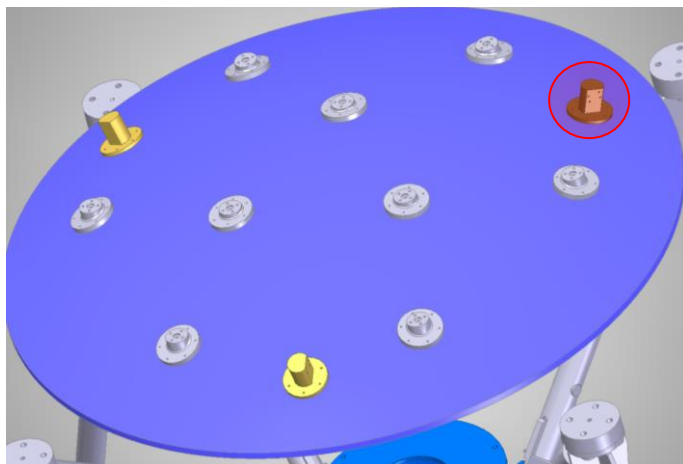


Figure 4. 3D view of the pads on the back surface of M2. The red circle shows the position of the tangential pad with different orientation of the interface holes.

The position of the pad with a different angle of rotation for the holes respect to the other pads is shown in Figure 2 and in Figure 4.

The mechanical drawings of the tangential pads are given in Figure 7.

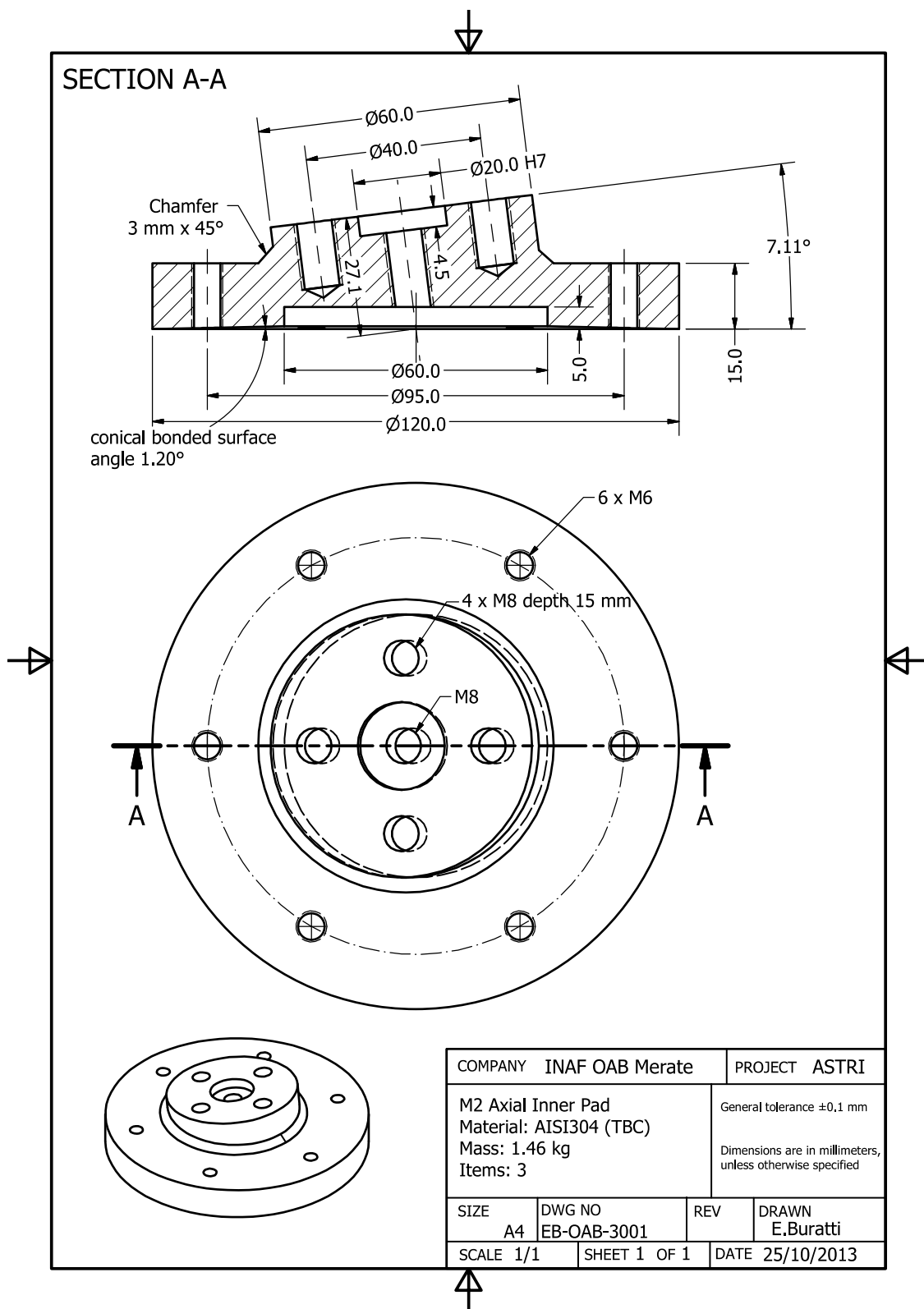


Figure 5. Mechanical Drawing M2 Axial Inner pad, ASTRI-INAF-DWG-7222.100-01 (formerly EB-OAB-3001).

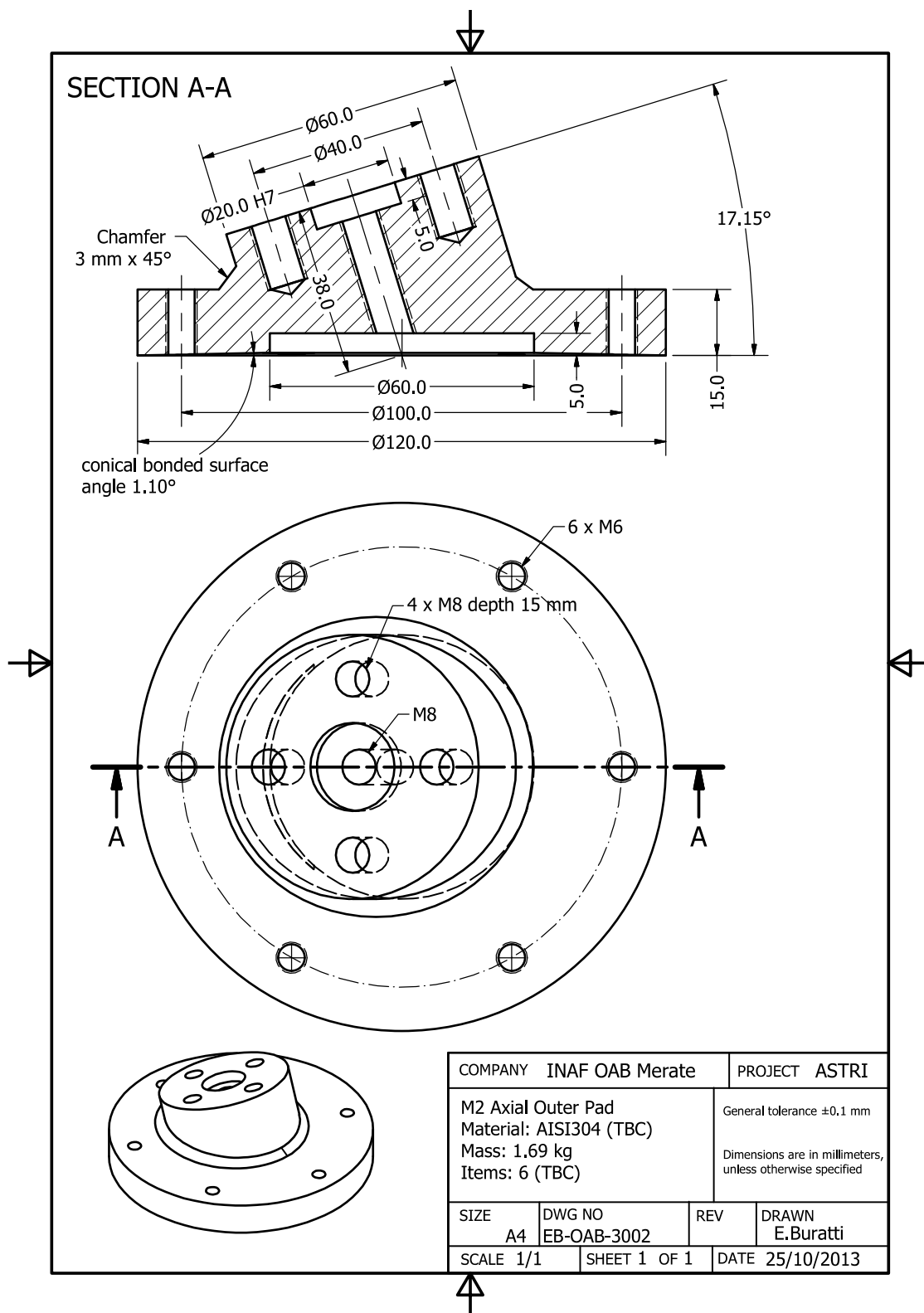


Figure 6. Mechanical drawing of the axial outer pad, ASTRI-INAF-DWG-7222.200-01 (formerly EB-OAB-3002).

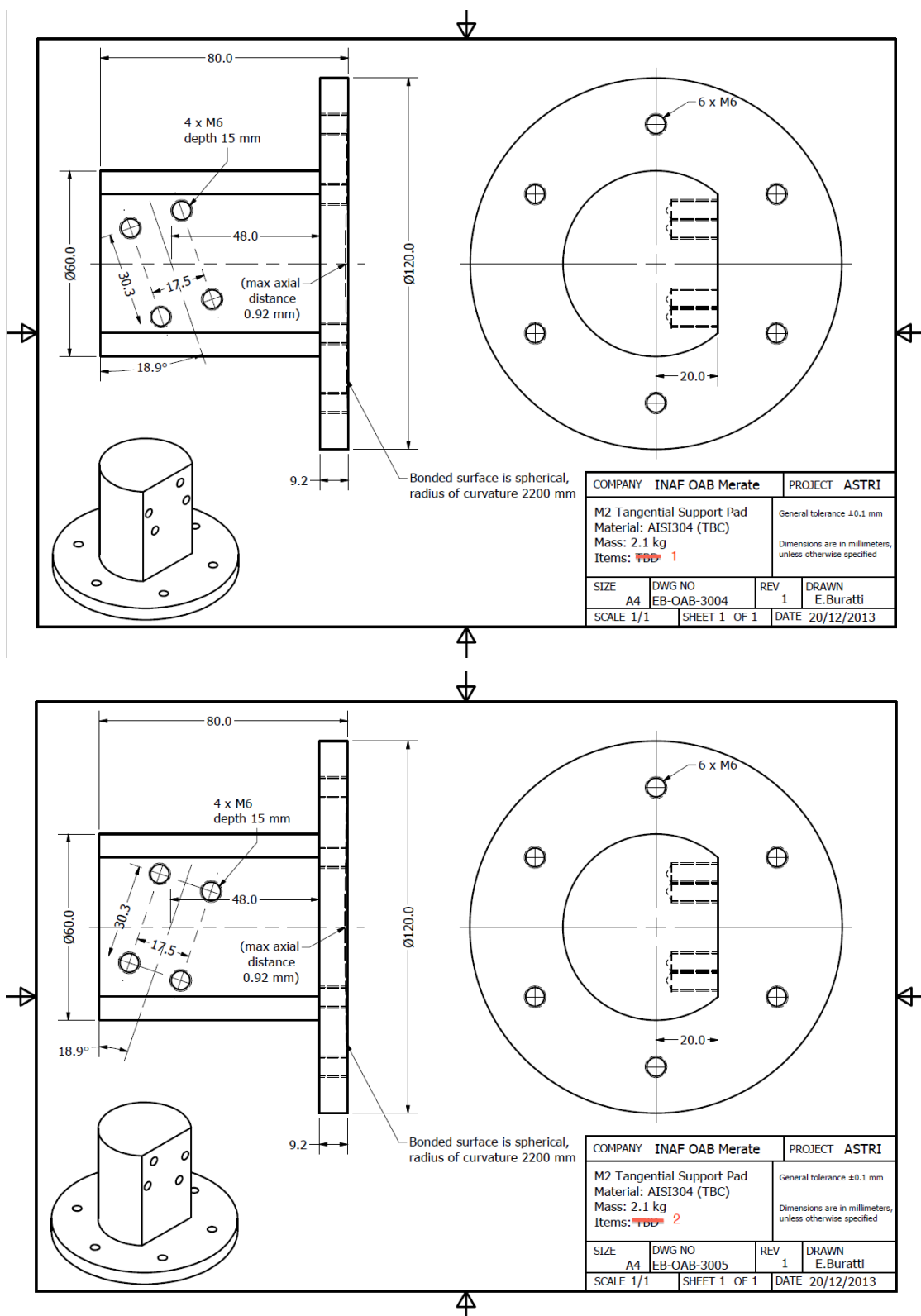


Figure 7. Mechanical drawings of the tangential support pads, ASTRI-INAF-DWG-7222.310-01 and ASTRI-INAF-DWG-7222.320-01 (formerly EB-OAB-3004 and EB-OAB-3005).