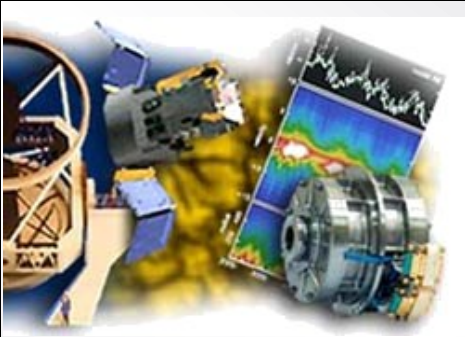


**INSTITUTO DE ASTROFÍSICA DE CANARIAS**

**OPTICON H2020**

**Additive Manufacturing for Astronomical  
Instrumentation Workshop**

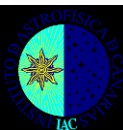
**Edinburgh January 21-22, 2016**

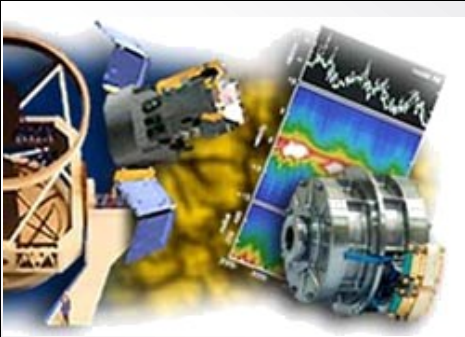


# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ CONTENTS

- MECHANICS DEPARTMENT OUTLINE
- AM EXAMPLES
- IAC INTEREST
- SPANISH AM RESEARCH INSTITUTIONS

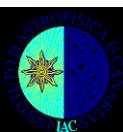


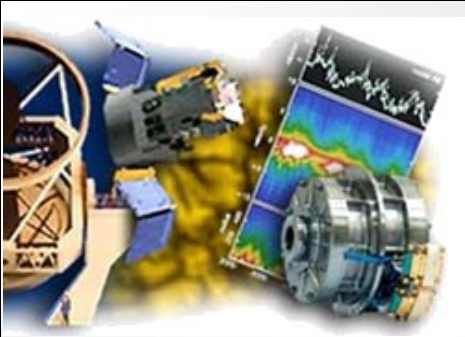


# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ IAC MECHANICS DEPARTMENT OUTLINE

- **Development of mechanical systems for astronomical instruments**
  - Mechanisms, structures, cryogenic and optomechanics systems (VI, IR & MW)
  - 3D design (CREO), FEA analysis (ANSYS)
  - Fabrication techniques, quality control and mechanical systems AIV
  - Facilities: AIV Lab, CAD/CAE room
  - 11 Mechanical Engineers

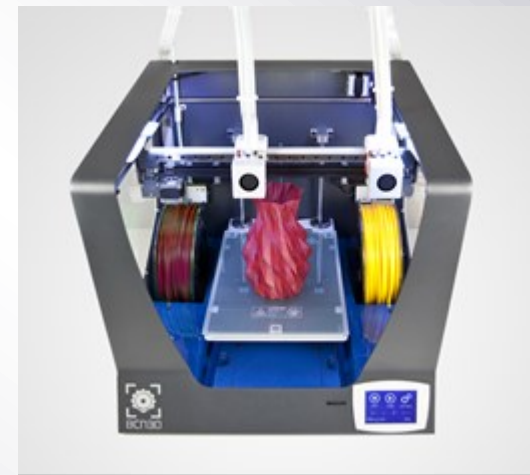


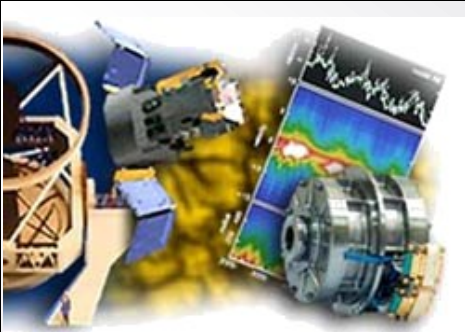


# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ IAC MECHANICS DEPARTMENT OUTLINE

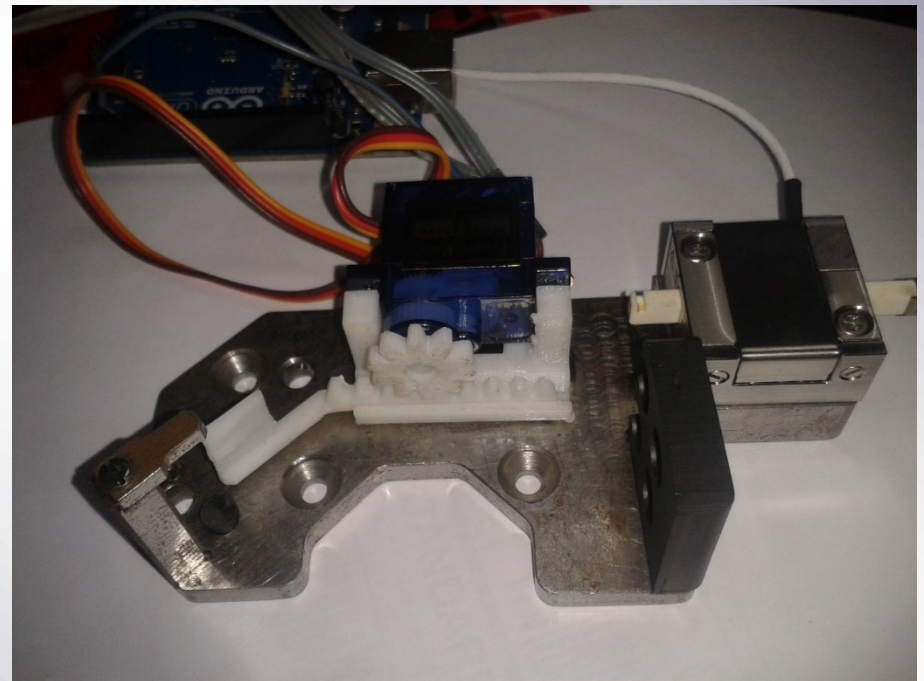
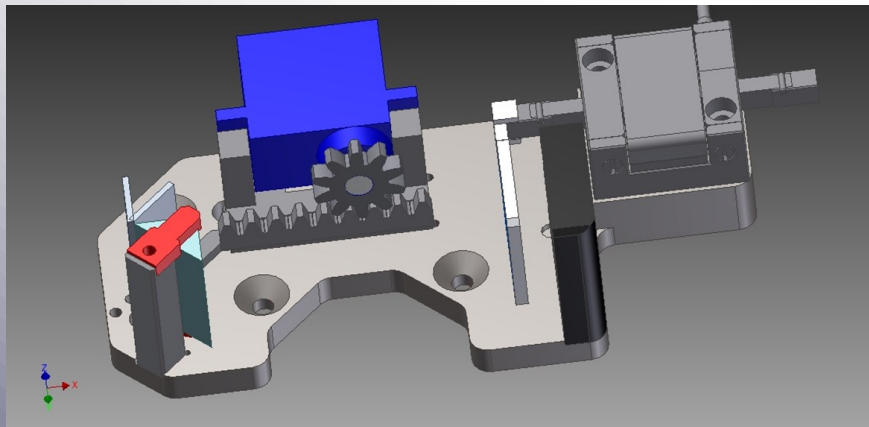
- **Not AM expertise**
- **FDM facility (BCN3D-Sigma)**
  - **Build volumen**
    - **210x297x210 mm**
  - **Filament diameter**
    - **3 mm**
  - **Layer resolution**
    - **0,05 - 0,35 mm (0,4mm nozzle)**
  - **Free software**
    - **Cura**



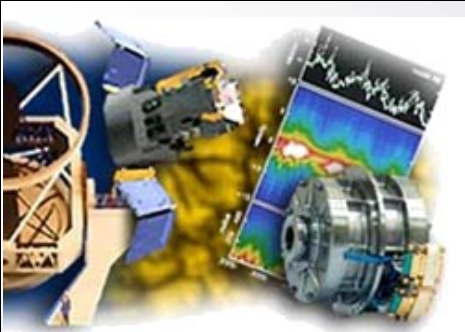


# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ AM EXAMPLES: HORS (GTC, ORM)

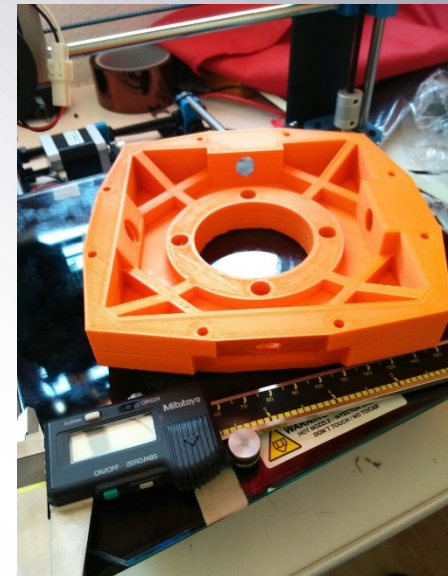
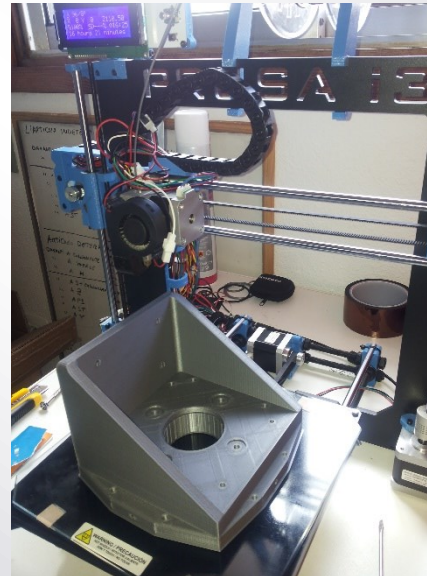
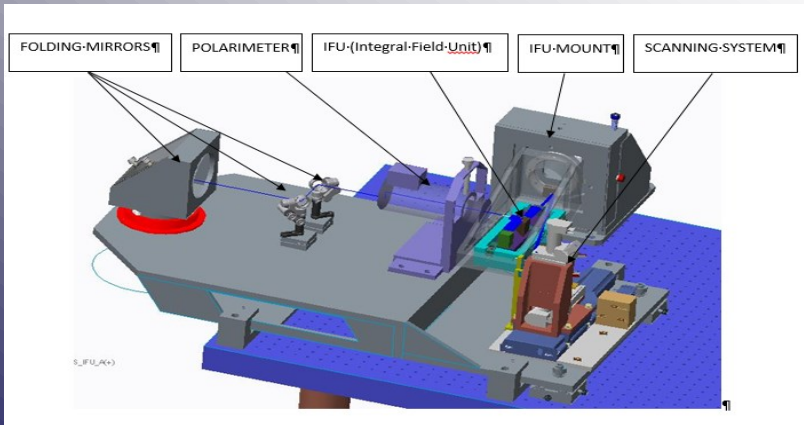
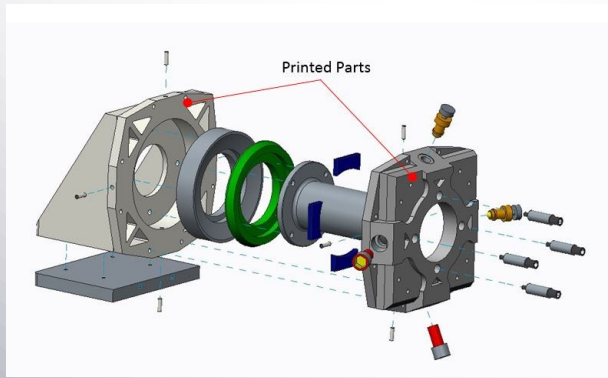


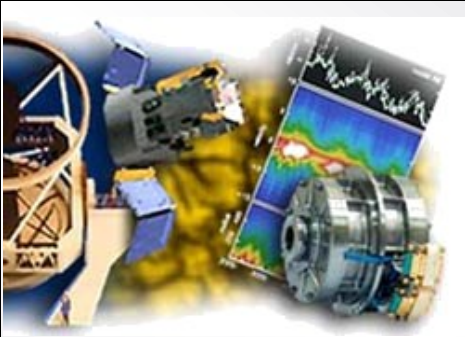




# Additive Manufacturing for Astronomical Instrumentation Workshop

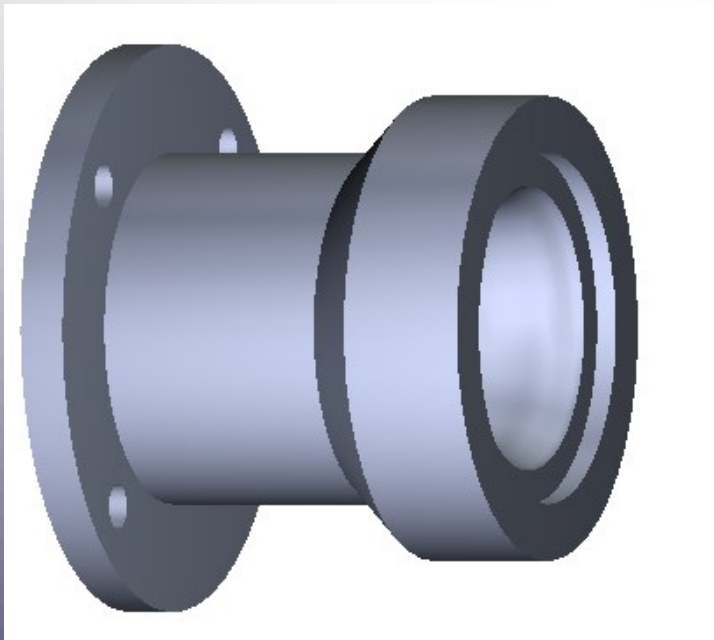
## ➤ AM EXAMPLES: GREY (GREGOR, OT)

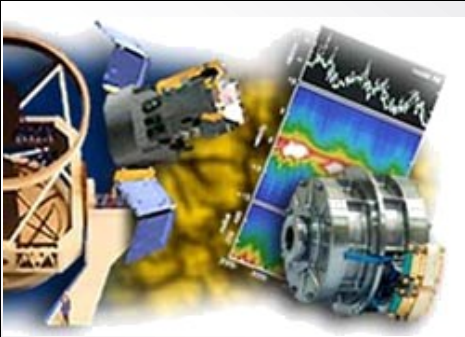




# Additive Manufacturing for Astronomical Instrumentation Workshop

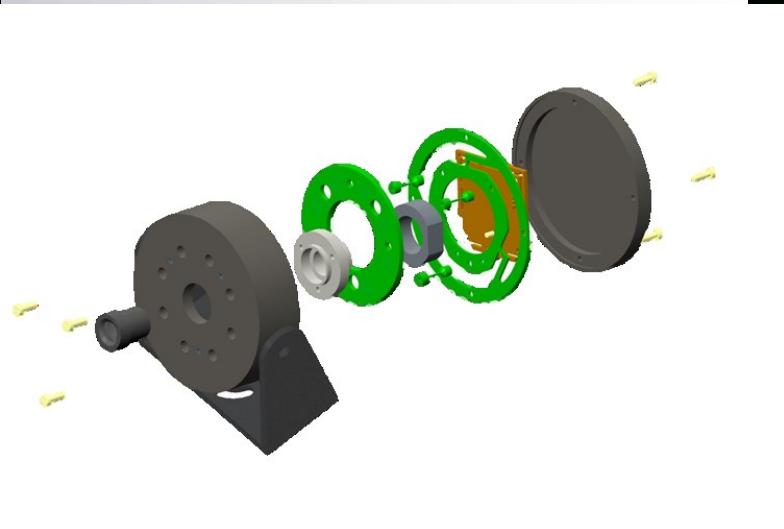
## ➤ AM EXAMPLES: FGI (QUIJOTE, OT)



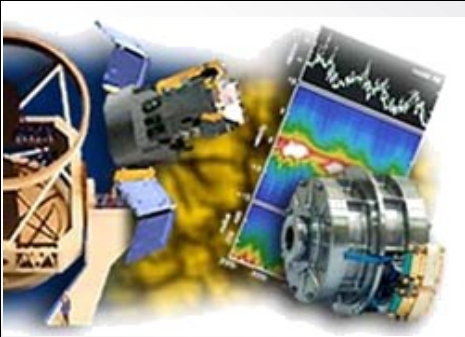


# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ CRYOWEBCAM DEVELOPMENT





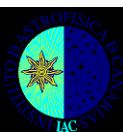


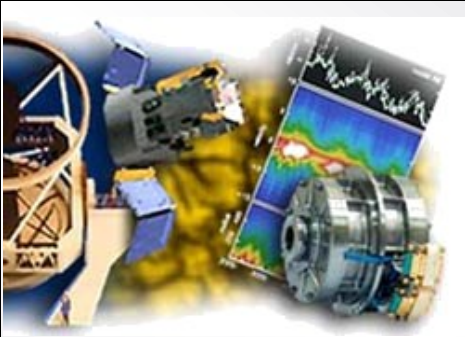
# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ IAC INTEREST

### ▪ Mechanisms

- Moving mechanisms
  - Linear & Rotating
  - Lightweight designs
  - Functionality integration
- Flexure mechanisms & flexure springs
- Magnetic actuators
- Position sensors devices
  - Integrated micro-switches

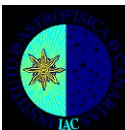


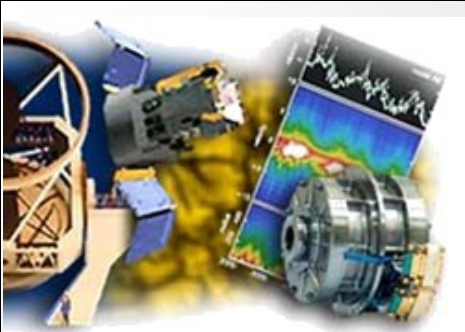


# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ IAC INTEREST

- **FEA analysis**
  - Simulations at both ambient & cryogenic temperatures
  - Inverse engineering
- **Tests and measurements systems**
  - Mechanisms characterization
  - Materials characterization

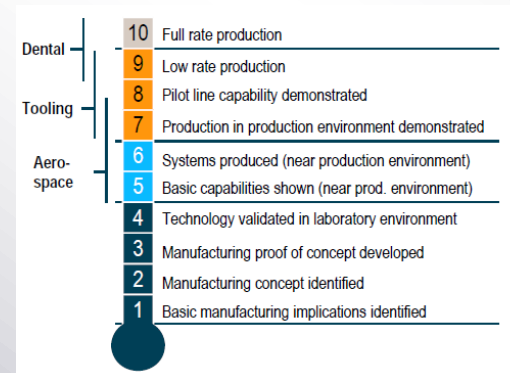
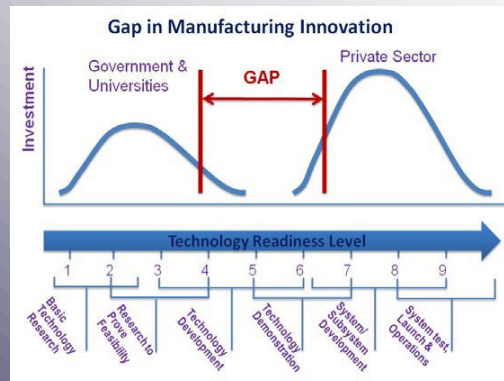


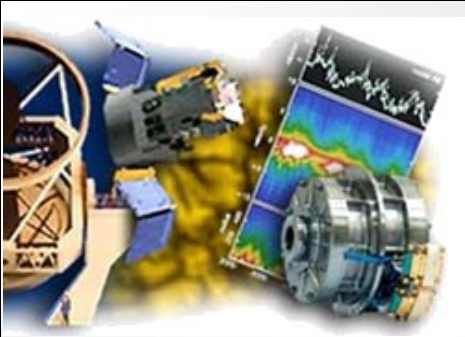


# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ IAC INTEREST

- Design guidelines for AM
- AM standards
- Technology and Manufacturing Readiness Levels (MRL & TRL)





# Additive Manufacturing for Astronomical Instrumentation Workshop

## ➤ SPANISH AM TECHNOLOGY CENTERS

- **PRODINTEC**
  - <http://www.prodintec.es/>
- **IK4 LORTEK**
  - <http://www.lortek.es/>
- **AIMME**
  - <https://aimme.com/es/>
- **AITIIP**
  - <http://www.aitiip.com/>

