



REMOTE HANDLING SYSTEMS

Ronald Guzmán Collazos

Mechanical Engineer

Head of Telescopes and Large Structures Group



Presentation Agenda

- ESO overview
- Current remote handling systems at ESO
 - VLT, ELT, ALMA.
- Future tenders
 - ESO Paranal Observatory Integrated Operations Programme

Questions



Overview - European Southern Observatory

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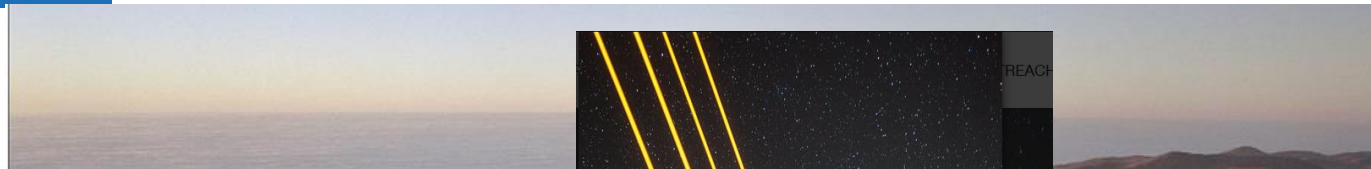
- The foremost intergovernmental astronomy organisation in Europe and the world's most productive ground-based astronomical observatory.
- Focused on the design, construction and operation of powerful ground-based observing facilities enabling astronomers to make important scientific discoveries
- Headquarters in Garching - Munich
- ESO Sites in Chile
 - La Silla
 - Paranal - VLT.
 - ALMA
 - Armazones - ELT





Remote handling systems VLT

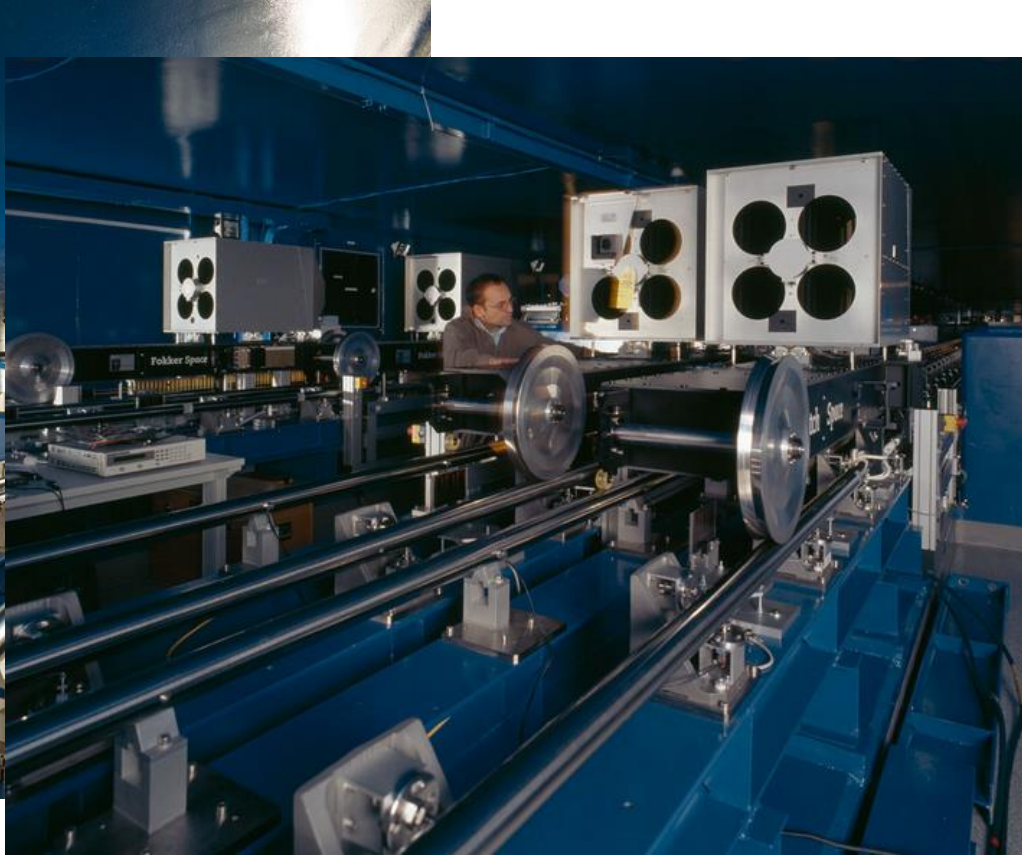
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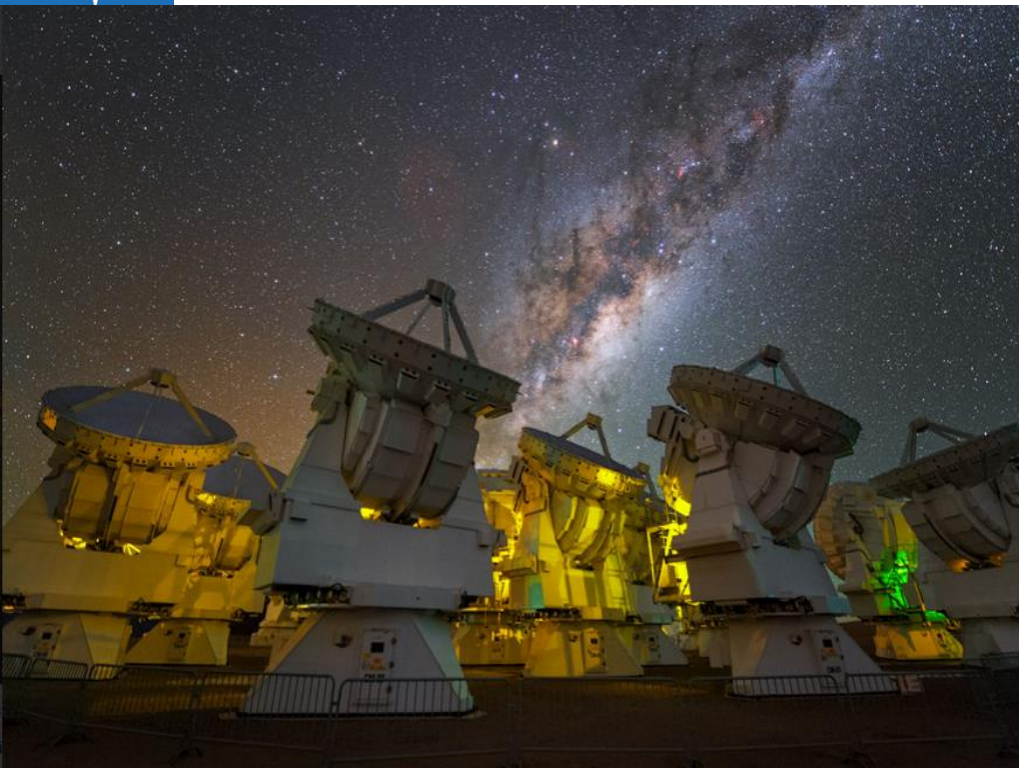
Remote handling systems VLT

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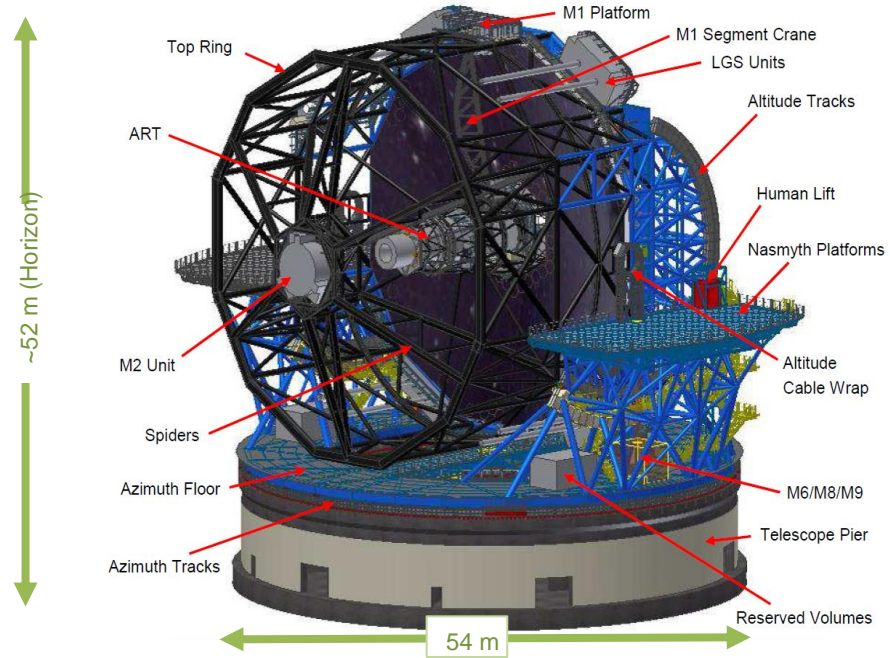
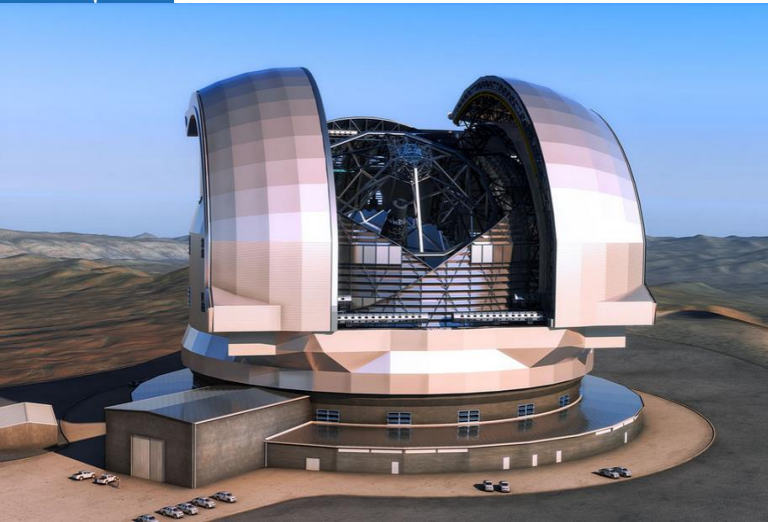
6th October 2022, Ronald Guzmán

Remote handling systems ALMA



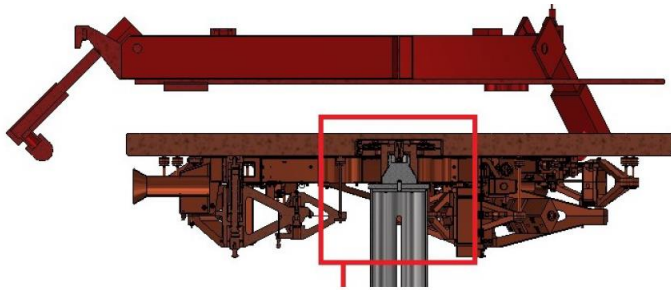
Remote handling systems ELT

Dome & Main Structure (DMS)



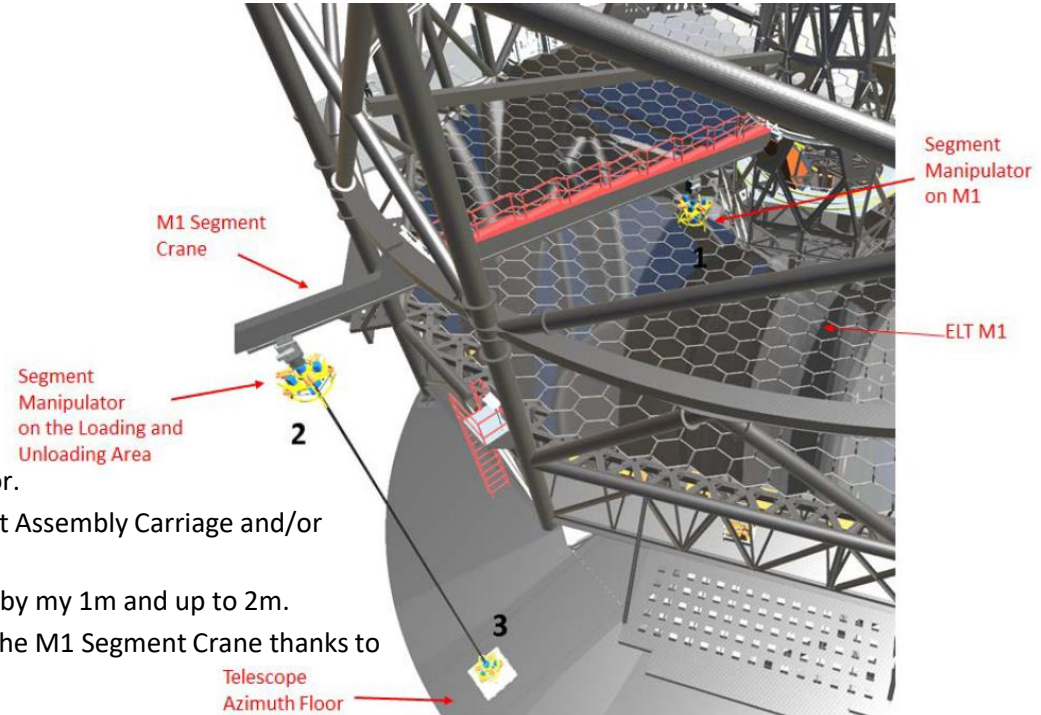
Remote handling systems ELT

➤ M1 Segment Manipulator



Main functional specifications

- Grabbing and releasing of a Segment Assembly on the Extractor.
- Grabbing and releasing of a Segment Assembly on the Segment Assembly Carriage and/or transport box.
- The M1 Segment Manipulator shall lift and lower the segment by my 1m and up to 2m.
- The M1 Segment Manipulator shall be easily removable from the M1 Segment Crane thanks to an Adaptor





Future tenders - ETF internal transporter

Characteristics:

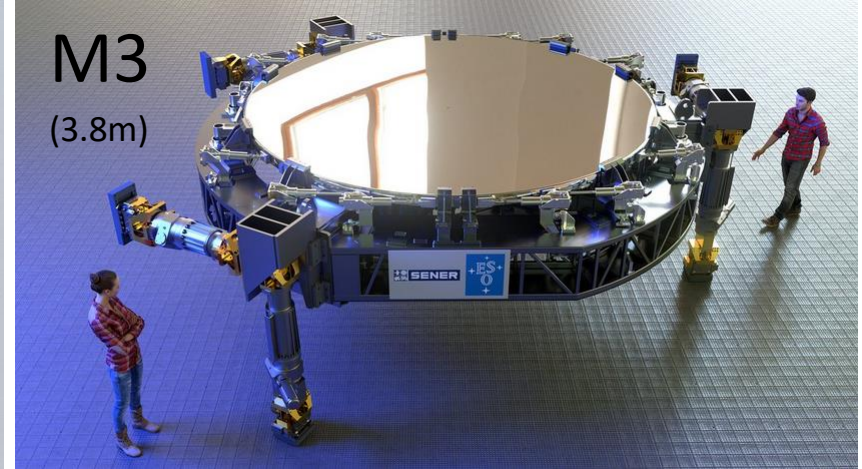
- Max mass of the unloaded transporter 14000kg.
- Max mass to be lifted and then transported 35000kg.
- The transporter shall be designed and constructed to withstand accelerations resulting from earthquakes
- The driving speed of the transporter shall be continuously adjustable from 0 to 0.2m/s in, as a minimum, in the X and Y directions.
- The transporter is intended to transport the following items of the ELT:
 - M2 Unit Transport Container, with or without the M2 Unit
 - M3 Unit Transport Container, with or without M3 Unit
 - M4 Unit support structure with or without M4 Unit
 - M5 Unit Transport Container with or without the M5 unit.
 - Modules of Nasmyth instruments (Volume 7x7x6m "L x W x H").

ELT Mirrors

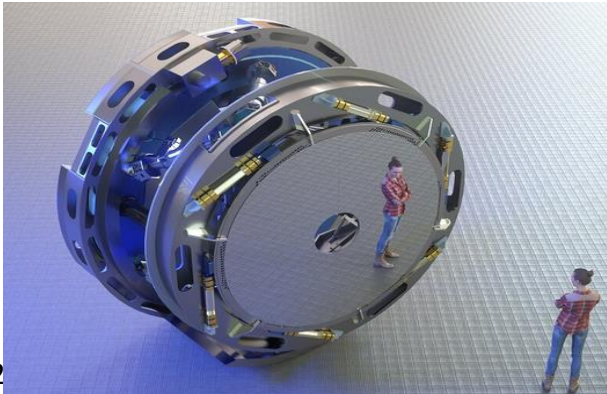
M2
(4.25m)



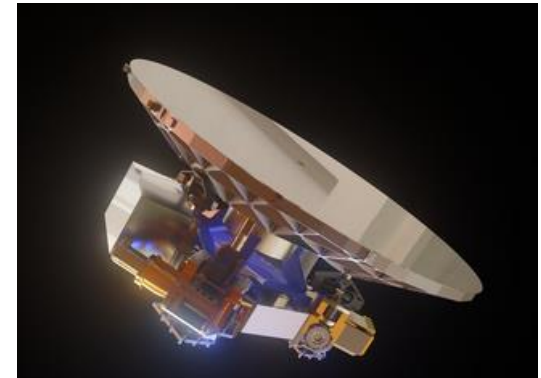
M3
(3.8m)



M4
(2.4m)



M5
Elliptical flat
(2.6m by
2.1m)



Automatic connection for refilling of LN2

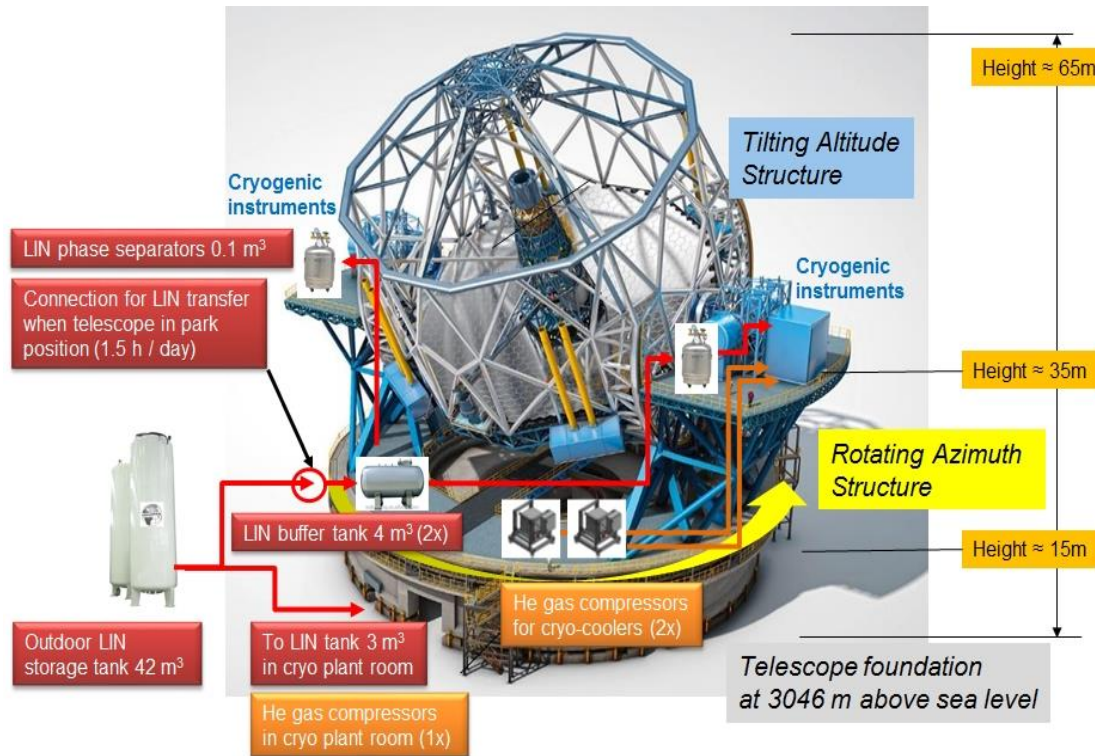
(Cryogenics and vacuum technology at ESO, in parallel session C3)

ELT Cryogenic infrastructure

- 2wo different sub-systems,
 - the Liquid Nitrogen infrastructure
 - Cryo-cooler infrastructure.
- For the refilling of the LN2 tanks

Charcteristics

- Temporary interconnection between the static telescope basement and the rotating Azimuth structure.
- The connection shall only be coupled when the telescope is in nominal parking position.
- During the refilling process the telescope Azimuth rotation shall be blocked and interlocked.
- The duration of the refilling process shall be limited to in total 1.5 hours per day during daytime.





ESO Paranal Observatory Integrated Operations Programme



ESO will be operating 2 sites. Paranal and Armazones

Develop an operational model aimed to:

- Provide the required performance at optimized cost and minimized environmental impact.
- Lean process development approach.
- Phase A. Quantify the net benefits of a resource oriented upgrade.
 - Projection of resource savings and sustainability over the observatory mission lifetime - 30 yrs.
 - Consideration of Industry 4.0 technologies and the consequent implementation of a digital transformation of a large-scale observatory
- Phase B. Develop and implement associated implementation projects.
- Phase B/C. Business opportunities for companies interested in this project will materialize during the development and implementation phases, where several procurements should result in the award of relevant contracts.



ESO Paranal Observatory Integrated Operations Programme



Main areas related to remote handling

- Site Safety & Security
- Operations Management
 - Centralised Monitoring, Analysis and Control

Centralised monitoring, analysis and control will be applied to all relevant facilities and systems on site and requires

- Centralised safety and security monitoring and access control
- Centralised emergency monitoring and control
- Centralised operations planning, monitoring and control
- Basic data analysis techniques for all scientific, technical and logistics data streams
- Basic (operator-driven) remote control of all relevant facilities and systems
- Advanced (semi-automatic data and algorithm-driven) remote control of all relevant facilities and systems.
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ESO Paranal Observatory Integrated Operations Programme



- Science and Technical Operations.
- Technical maintenance of telescope facilities and auxiliary equipment
 - Consumes most of the resources.
 - Maximize the scientific productivity of the VLT and ELT by meeting the goal to reduce the telescope unscheduled downtime to a target of 3% during a year period.
 - Ensure an optimal performance level of telescope and instrumentation
 - Support opportunities for technical upgrades of the facility over the lifetime.
 - Develop remote monitoring and maintenance (RMM) concepts at all maintenance levels.
 - The digital transformation of technical and maintenance operations



Future tenders budget

#	Description	Placed by	Timeline
1	ELT internal transporter (for M2/M3/M4/M5 and instruments)	ESO	2023
2	ELT-ETP internal transporter (for M2/M3/M4/M5 and instruments)	ESO	2022
3	Automatic connection for refilling of LN2		
4	Integrated operations programme	ESO	2022-2028

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Thank you

