

## **Juan Carlos Palacio** **European Southern Observatory (ESO)**



**ELT**

**VLT**

**ALMA Antennas**

# Precision structures in large ground-based telescopes

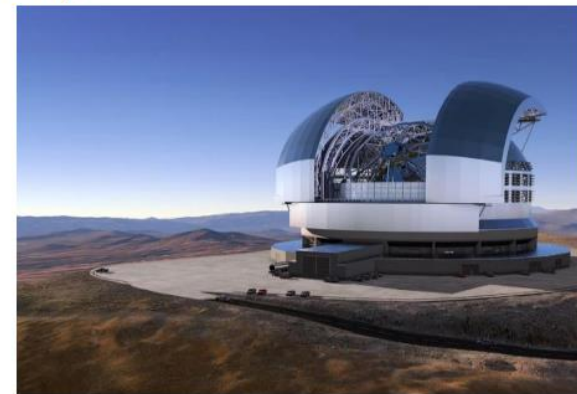
- ESO, the European Southern Observatory (or formally the European Organisation for Astronomical Research in the Southern Hemisphere), is an intergovernmental organization with 16 Member States along with the host state of Chile
- The Very Large Telescope (VLT) Consist of four Unit Telescopes with a main mirror of 8.2 m diameter, two survey telescopes VST and VISTA, and four movable 1.8m diameter Auxiliary Telescope. The telescope can work together with Interferometry with a high precision.
- Around 240 people work in Paranal observatory in operation, upgrades and maintenance, typically on site there are 150 peoples, .
- The annual Budget for the VLT is 20 MEur (without personnel)
- Current Project : The European Extremely Large Telescope (ELT) is a 40m class optical telescope, near and mid infrared telescope to be located at Cerro Armazones. This telescope will be operated and serviced from Paranal Observatory ESO located approximately 30 km away (Budget :1.3 billion Eur.)
- Technical ELT First Light is planned for 2027

# Precision structures in large ground-based telescopes

VLT( Very Large Telescope- 8m)



ELT( Extremely Large Telescope-40m)



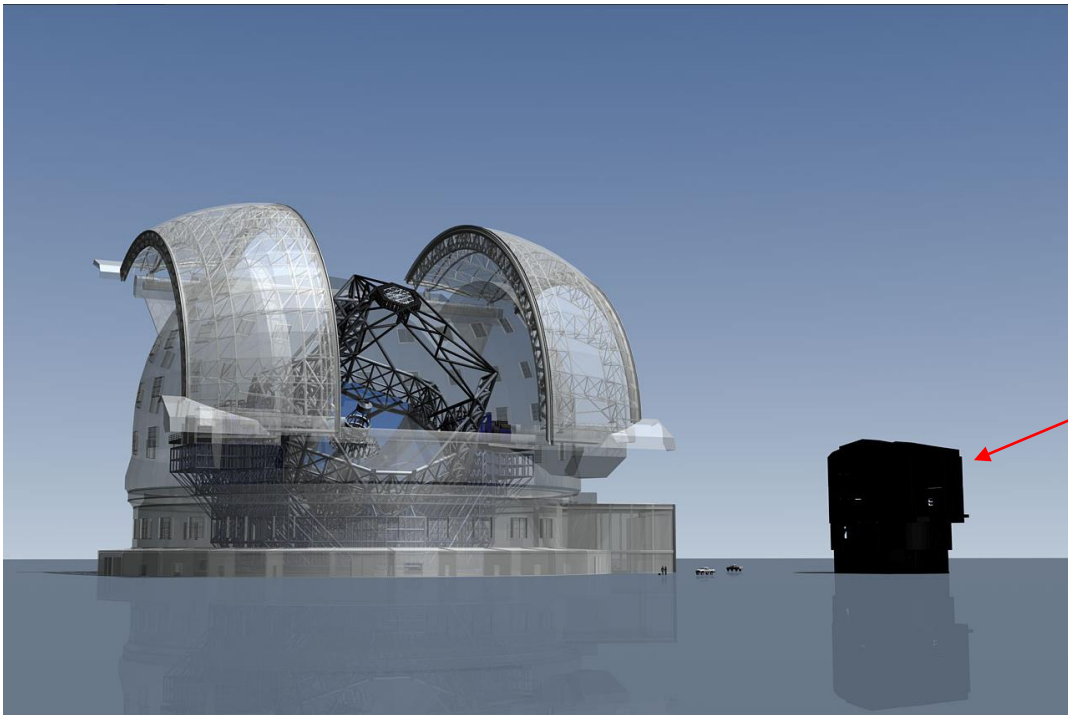


## Comparing buildings : ELT v/s Stadium Allianz Arena



## Comparing : ELT v/s VLT Telescope

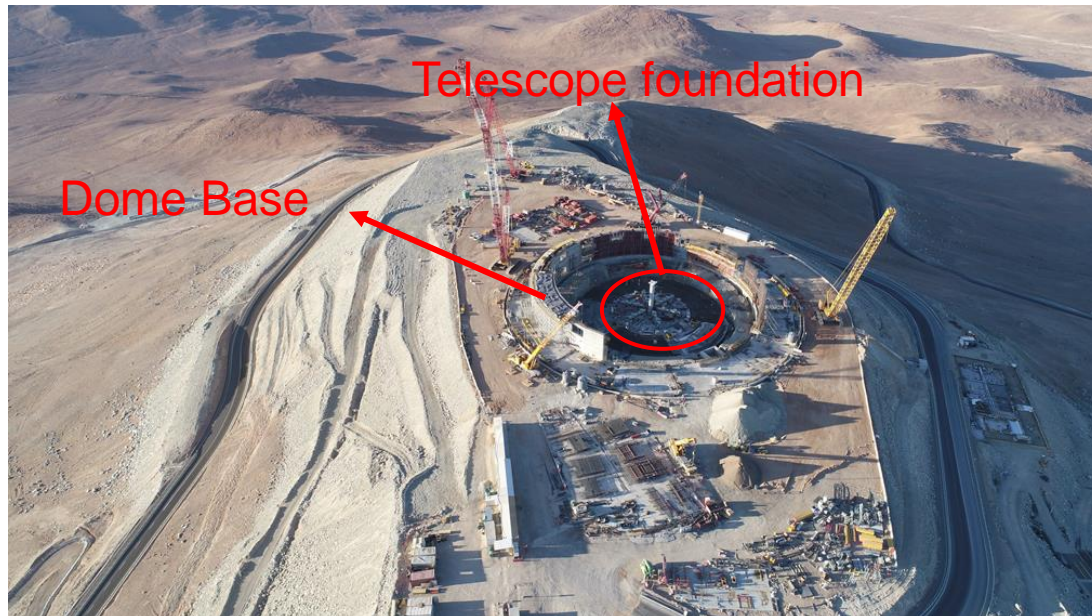
ELT (2027)	VLT (1998)
40 m-class	8 m-class
798 segment mirrors	Monolithic mirror





## ELT Telescope is under construction

- Civil works are the main activities on site
- Telescope foundation
- Dome Base

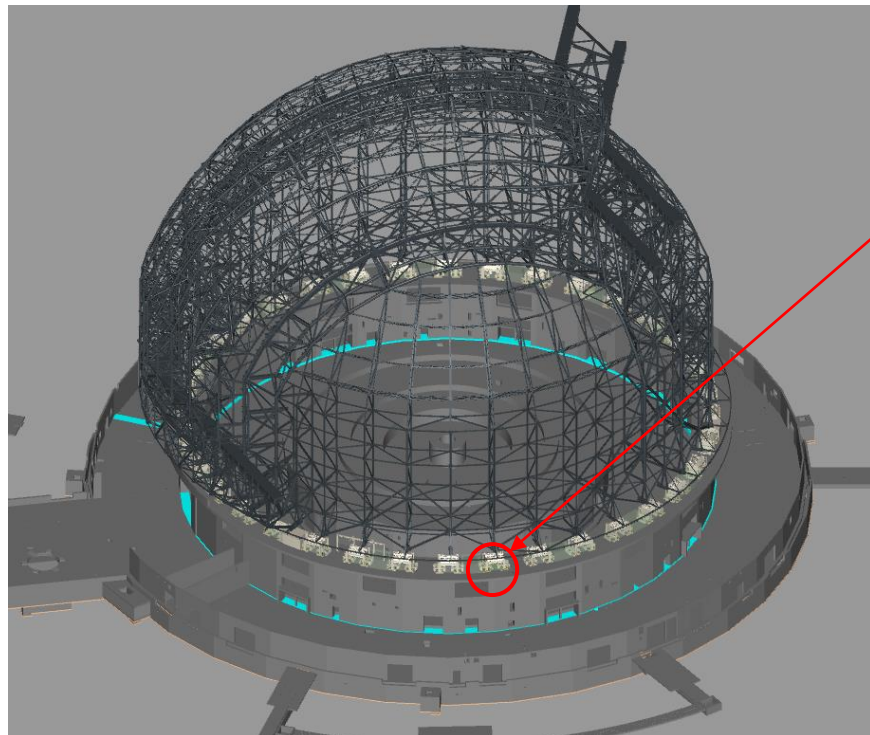


# Precision structures in large ground-based telescopes

ELT Dome rotates on 86 m diameter rail, 36 fix trolleys are supporting the dome.

Weight of the ELT dome is ~**6100 tones** (VLT dome mass is only 270 tones).

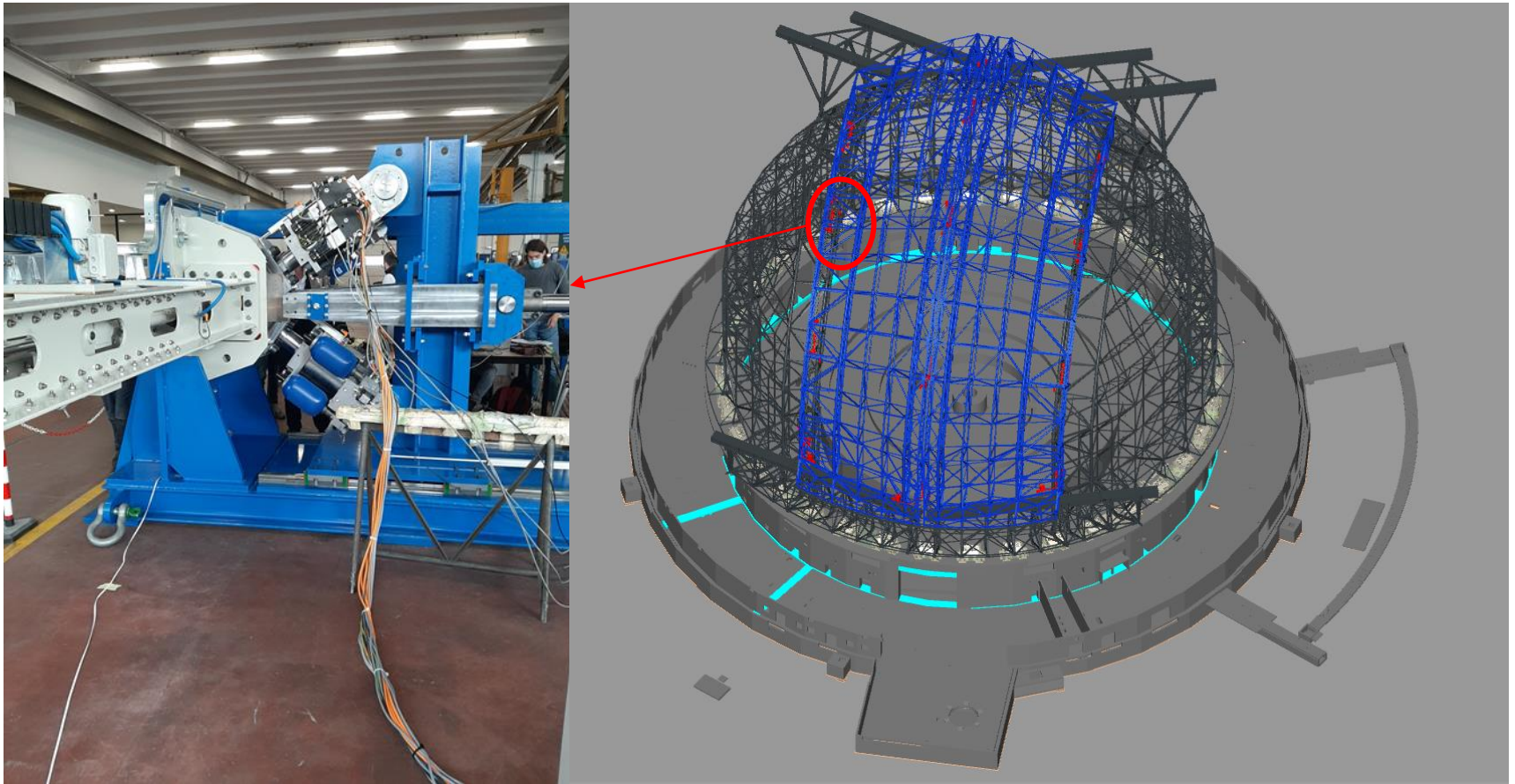
Each trolley weighs ~20 tones, consisting of 4 wheels, one motor, brake and encoder.



Dome trolleys



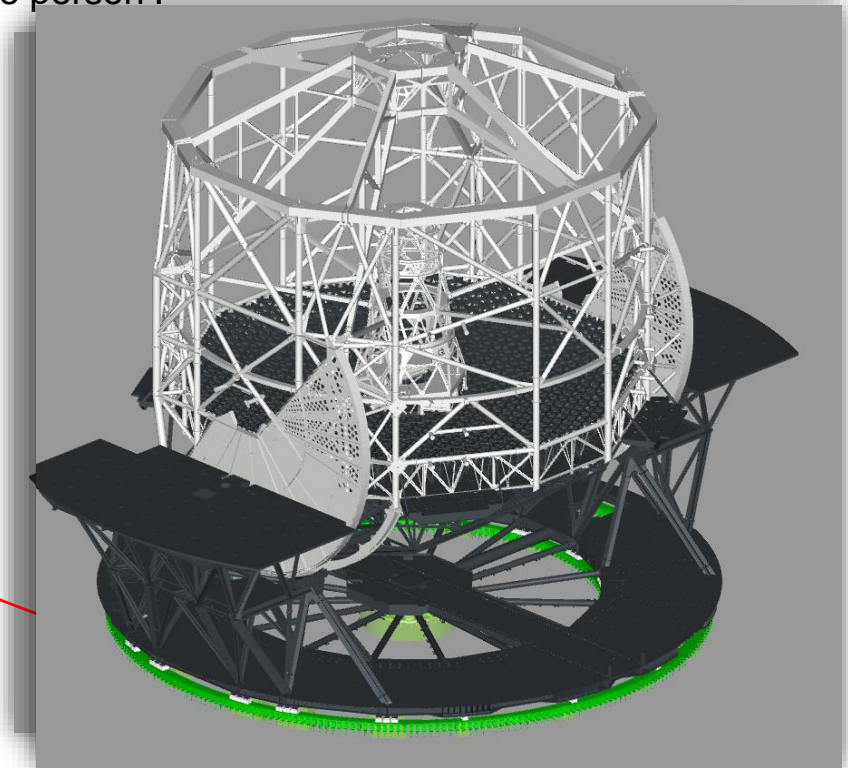
The observation doors of the Dome are secured by latching system, 13 of these units are distributed in the Dome.





## Telescope Main structure :

- The azimuth tracks are constituted by three axial tracks that support the telescope; the outer track has a diameter of 51 meters.
- The main structure weighs of 3700 tones and is supported by Hydrostatic Bearing System.
- The segment track and the joints are machined with high precision, to reduce friction and errors when the telescope track to observe the scientific objects.
- The entire mass of the telescope can be moved by one person .



## The Hydrostatic Bearing System (HBS)

- Oil film thickness to rotate the telescope is only between 50-100  $\mu\text{m}$
- Hydrostatic bearing system are constituted by 128 pads (VLT only 36 pads)



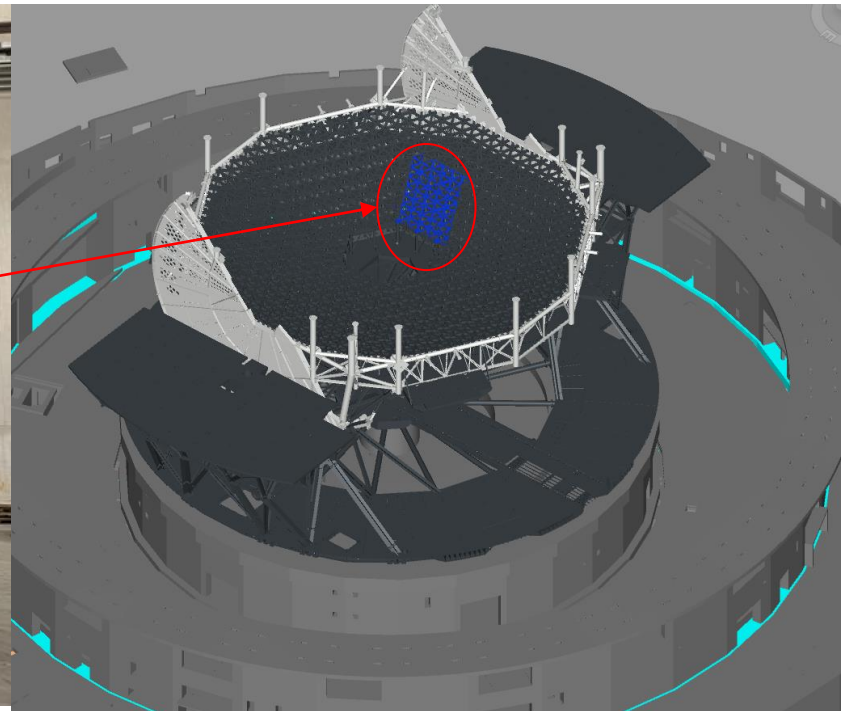


# Precision structures in large ground-based telescopes

M1 mirror cell consists of 798 segments.

The structure below in the picture will host 26 segments

The gap between the segments is 4 mm

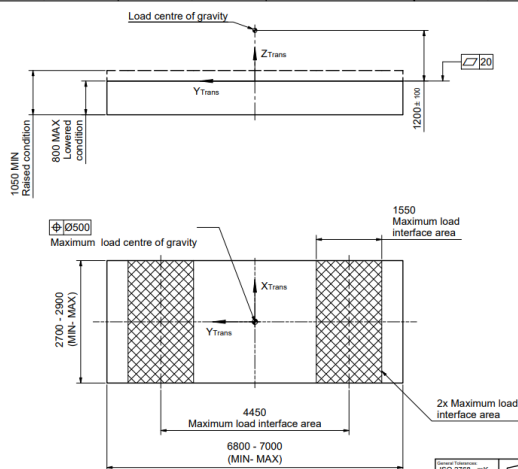




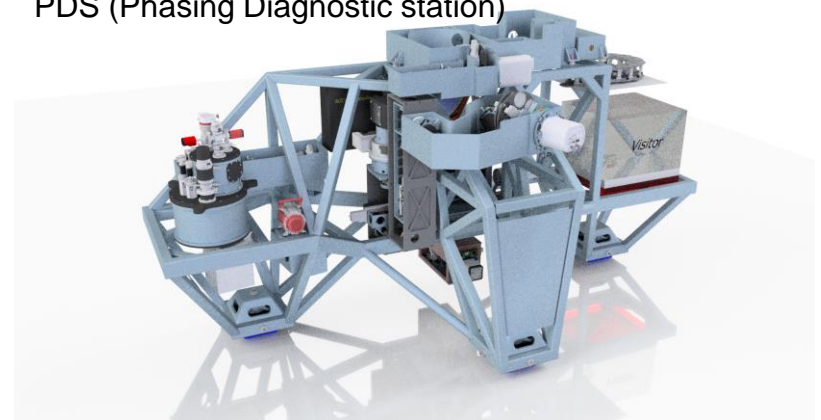
## Examples of upcoming procurement

#	Description	Contract type	Placed by	Start
1	Laser platform for Gravity Plus (UT1, UT2 and UT3)	Hardware procurement	ESO	2023
2	ELT internal transporter (for M2/M3/Instruments)	Hardware procurement	ESO	2022
3	4MOST Platform/handling	Hardware procurement	ESO	2023
4	PDS (Phasing Diagnostic station) structure fabrication	Hardware procurement	ESO	2023
5	Azimuth carriage for M3/M4/M5 unit	Hardware procurement	ESO	2025

ELT Internal transporter



PDS (Phasing Diagnostic station)





# Precision structures in large ground-based telescopes

## Budget :

The estimated procurement budget for ESO in the period 2022-2025 is 840 MEUR.

This volume is built of some remaining procurements for the ELT construction, and operational cost to run the existing sites (La Silla Paranal Observatory, ALMA observatory and APEX). The latter will be the vast majority of this volume.

The ELT project is under construction and a large of contracts are already in place

## How to do business with ESO :

Doing business with ESO” website is the following:

<http://www.eso.org/public/industry/cp.html>

<p><b>FORTHCOMING CALLS FOR TENDER</b>  <small>Advance Information on forthcoming Calls for Tenders/Preliminary Inquiries exceeding 150,000 EUR</small></p>	<p><b>PROCUREMENT PROCESS</b>  <small>An Overview of the ESO Procurement Process</small></p>	<p><b>GENERAL CONDITIONS</b>  <small>ESO General Conditions</small></p>
<p><b>FORTHCOMING CALLS FOR TENDER</b>  <small>Advance Information on forthcoming Price Inquiries/Calls for Tender/Request for Information from 50,000 EUR - 150,000 EUR</small></p>	<p><b>INDUSTRIAL LIAISON OFFICERS</b>  <small>Contact Details of Industrial Liaison Officers  Cooperation between</small></p>	<p><small>Update your information in the ESO Supplier database (for Europe)  Update your information in the ESO Supplier database (for Chile)</small></p>



## Advance information on forthcoming calls for tenders/ preliminary inquires

The screenshot shows the ESO website's 'Procurement at ESO' section. The main heading is 'ADVANCE INFORMATION ON FORTHCOMING CALLS FOR TENDERS/PRELIMINARY INQUIRIES'. Below this, there is a summary of the announcement and a table of details.

**Summary:** The page contains advance information on forthcoming Calls for Tenders and Preliminary Inquiries expected to exceed 150,000 EUR. It includes links for 'Advance Information on Forthcoming Calls for tender and Preliminary Inquiries' and 'Released Calls for tender, Preliminary Inquiries, Price Inquiries'. A red button labeled 'Express Interest for a Forthcoming Cft' is also present.

**Table: Advance Information on Forthcoming Calls for Tender and Preliminary Inquiries**

Cft No	Date	Division	Subject	Details	Scheduled for Issuance
270	02.09.2022	DOO	Supply of high bandwidth communication channels between the Paranal Observatory and ESO Offices in Santiago	Request for information (RFI) to investigate the solutions available and to identify companies that are interested in and capable of providing optical based dedicated communication channels of at least 100Gbps bandwidth, to connect the Paranal Observatory located 120km south of Antofagasta, in the Atacama region, and the ESO offices in Vitacura, Santiago RM. The provision is intended for a reference period of 10 years and includes the operational costs, starting from December 2021.  The RFI will be released in Q3/2020 to potential suppliers in in Chile. Based on the outcome of the RFI, ESO plans to issue the Call for Tender (CFT) end of Q4/2020.  The exact scope of work of the CFT will be defined after completion of the RFI.  The contract is expected to be awarded in Q2/2021, to the Bidder, which has submitted a fully compliant Tender and offers the best value for money for ESO taking into account the quality and price of the offer.	Request for Information  Release date: 11.09.2020  Closing date: 29.10.2020  Preliminary Inquiry  3rd Qtr. 2022  Call for tender  4th Qtr. 2022



# *Precision structures in large ground-based telescopes*



***End of presentation – many thanks for your attention***