Small-ELF @ OT

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Acercando industria al universo del IAC

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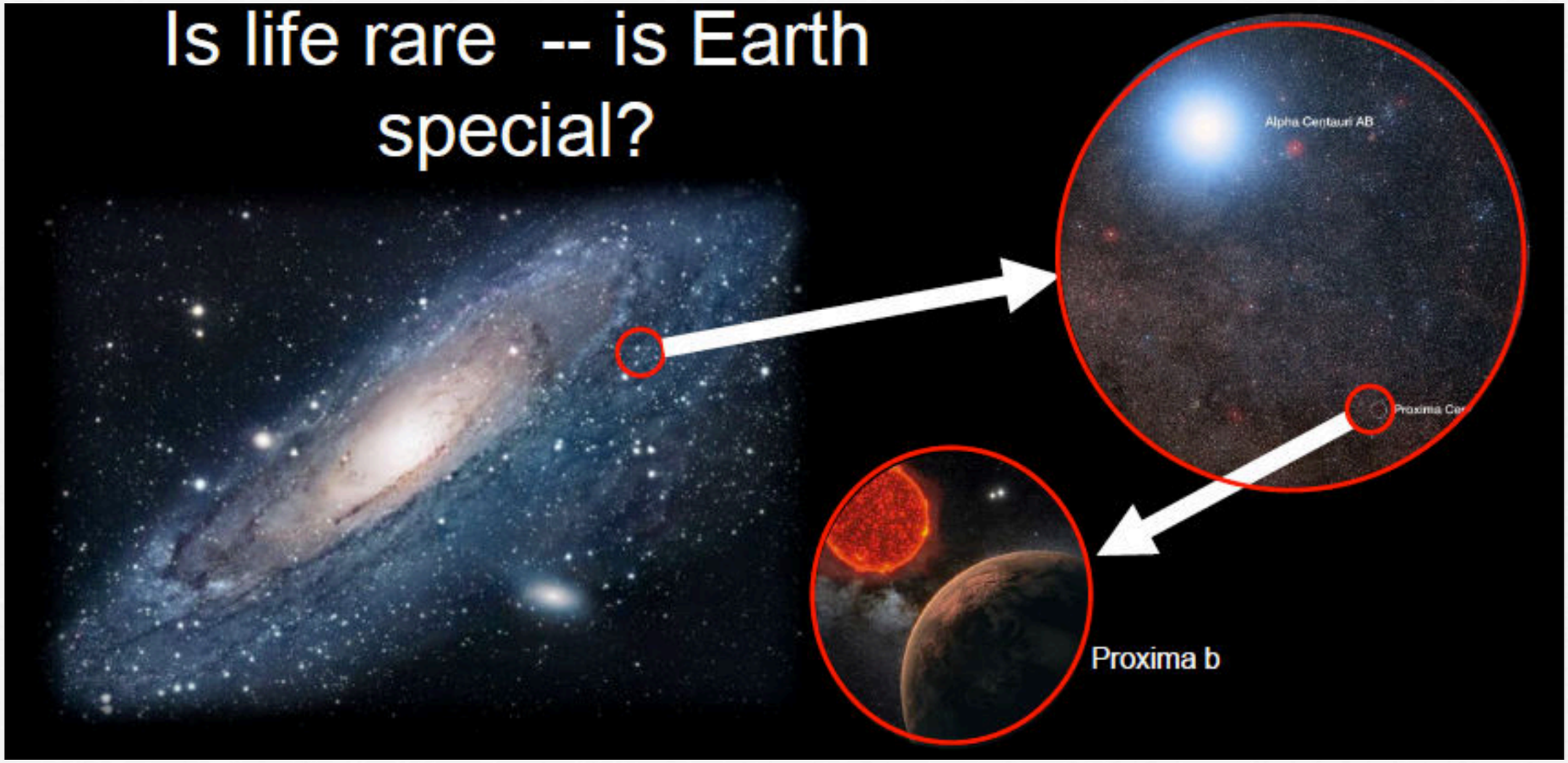
Is life rare ?



The ultimate goal is to find life in exoplanets

Key aspects to image exoplanets

1) high spatial resolution = angular separation
2) high dynamic range = contrast photometry
3) high sensitivity = depth
4) never mind the field-of-view
5) observe in the infrared
6) off-axis telescope segments
7) scalable distributed pupils

==> dedicated large coronagraphic telescope

The ExoLife Finder

https://exo-lifefinder.com/

New technologies

1) Fizeau hybrid optical interferometer
2) Low-mass tensegrity systems
3) Thin mirrors
4) Wavefront control and distributed aperture

Telescope with a diameter of ~35m

==> Telescope at least 10 times cheaper

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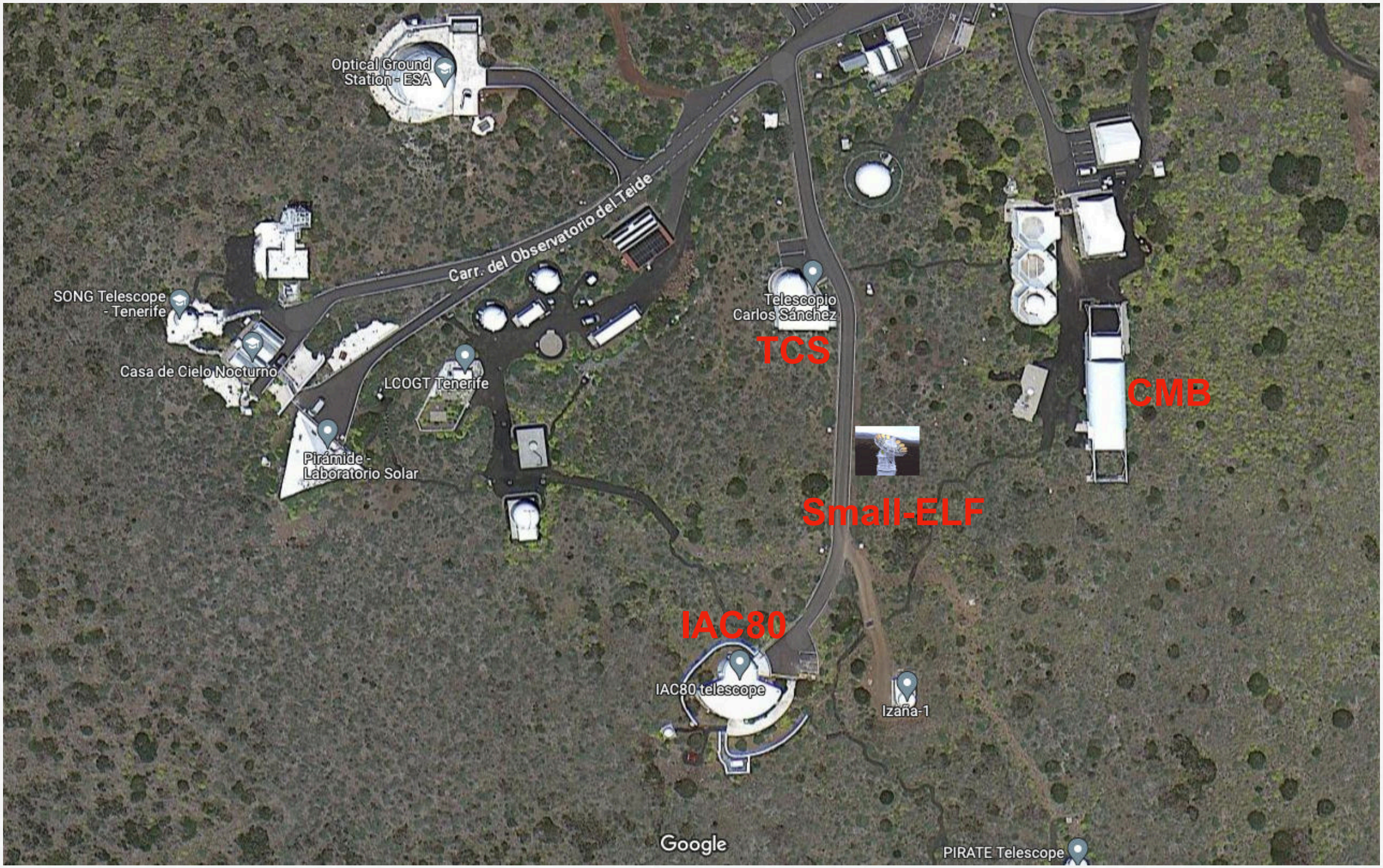
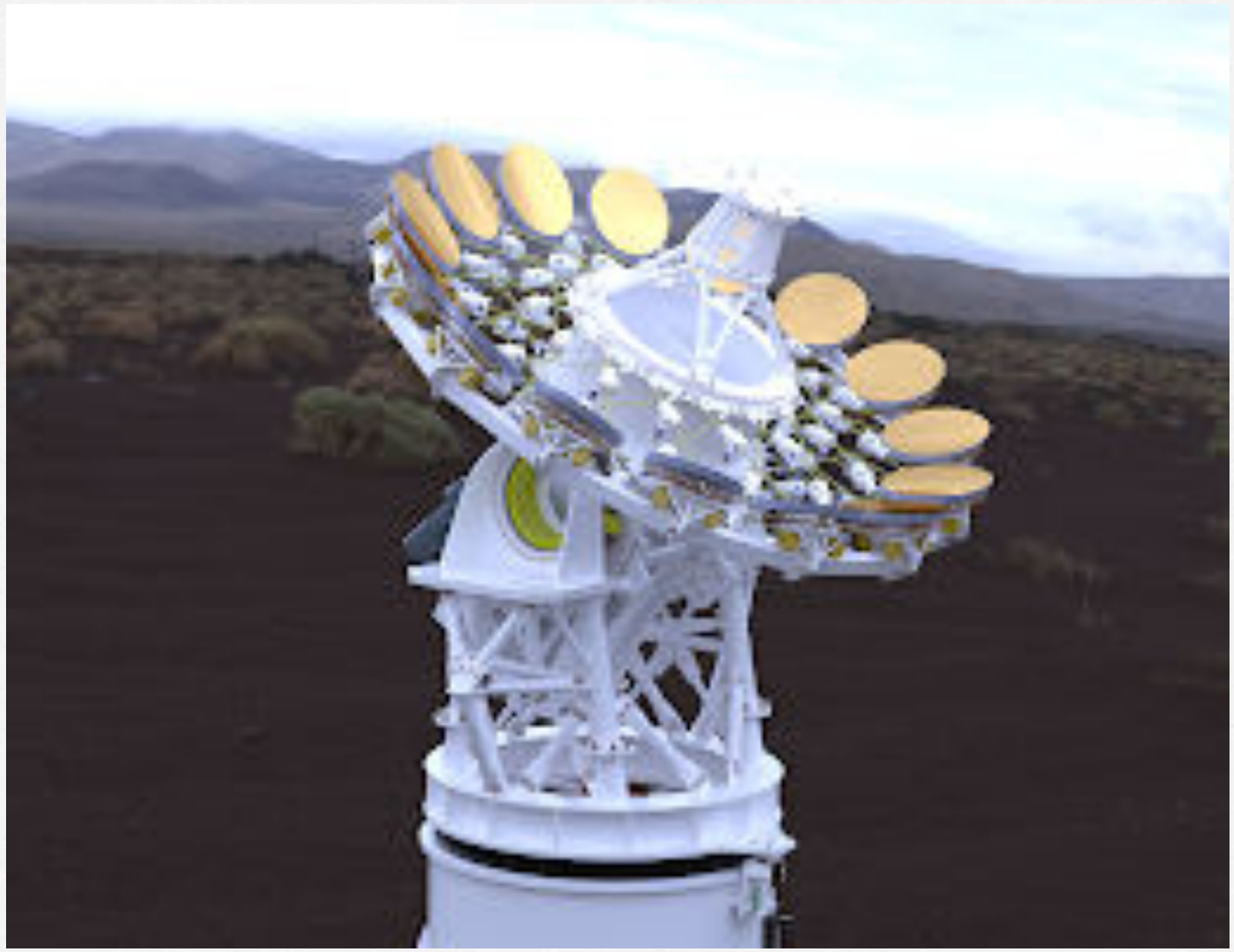
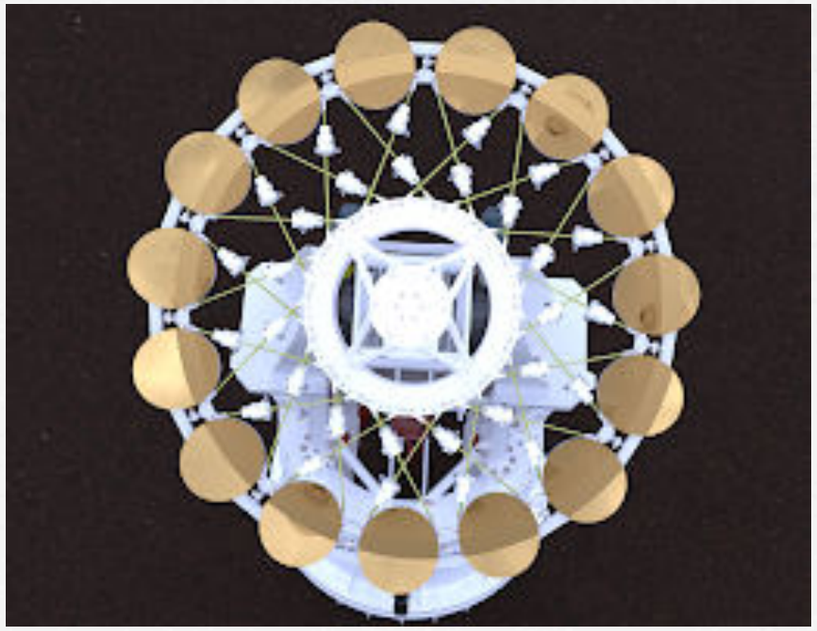

Optical Ground Station - ESA
Carr. del Observatorio del Teide
SONG Telescope - Tenerife
Casa de Cielo Nocturno
LCOGT Tenerife
Pirámide - Laboratorio Solar
Telescopio Carlos Sánchez
TCS
CMB
Small-ELF
IAC80
IAC80 telescope
Izaña-1
Google
PIRATE Telescope

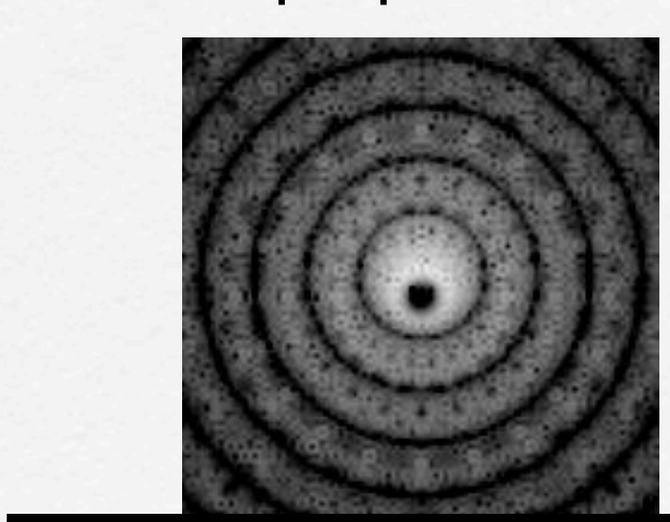
Small-ELF: design

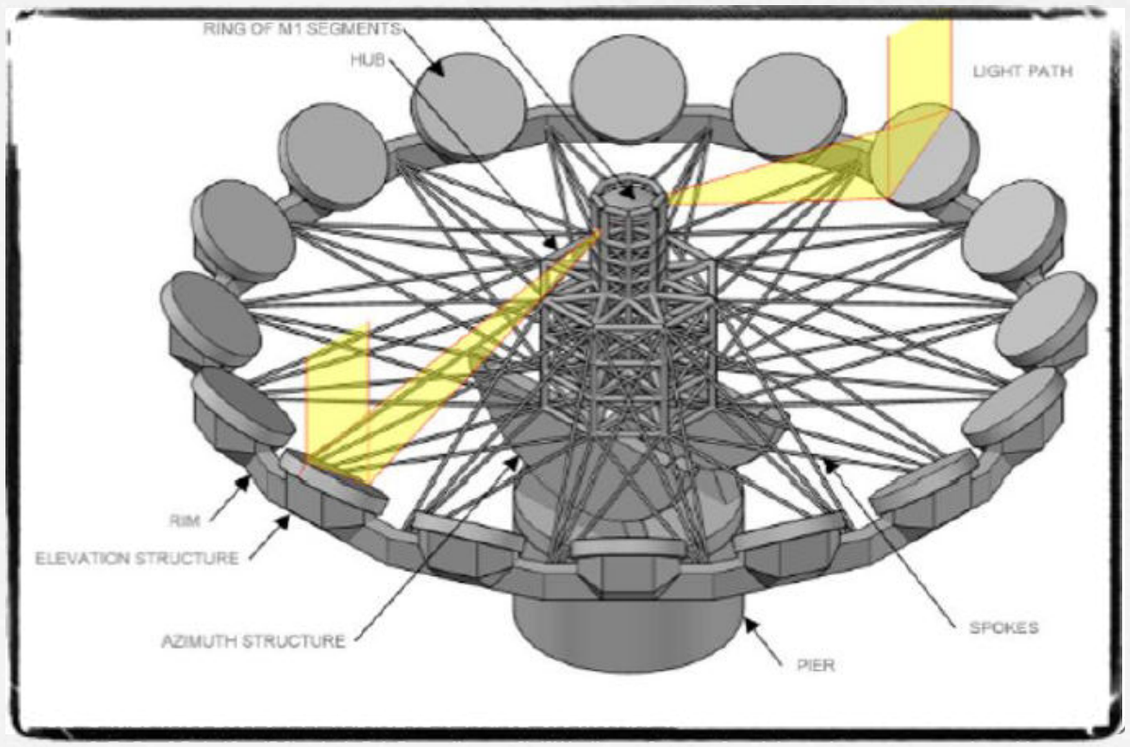




Fizeau optics

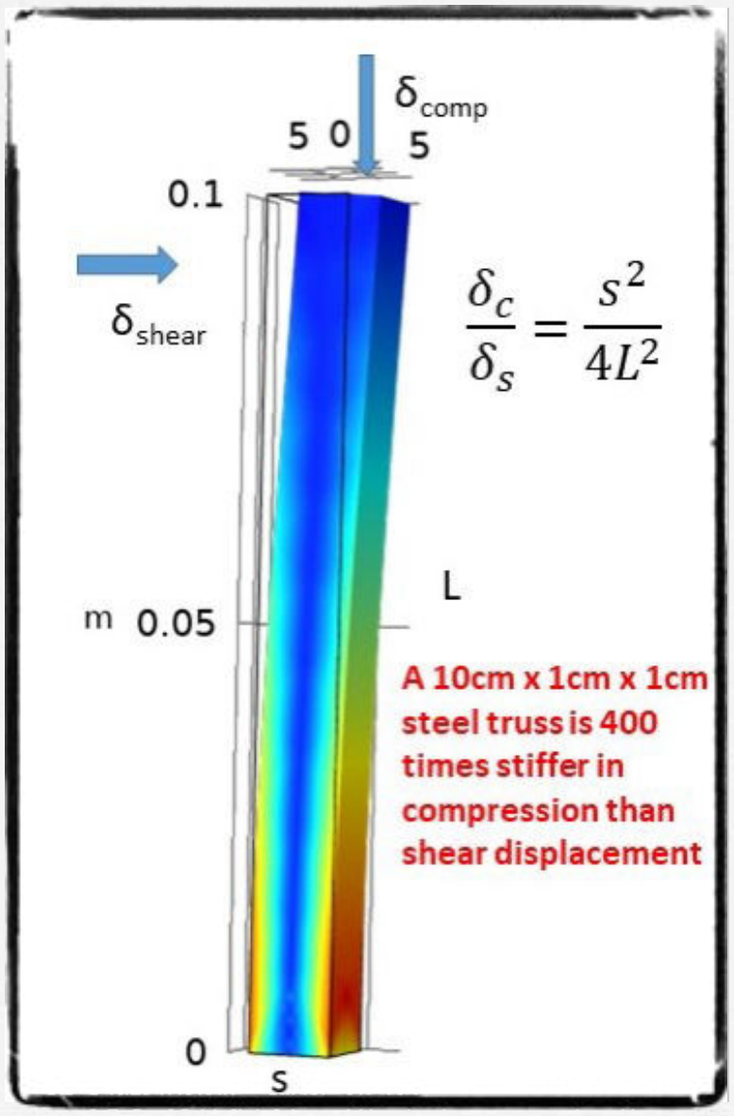
1. Scalable telescope subaperture units,
2. PSF can be synthesized
3. Nulling and dark spot coronagraphy are essential capabilities
4. Noise properties of PSF match high contrast photometry

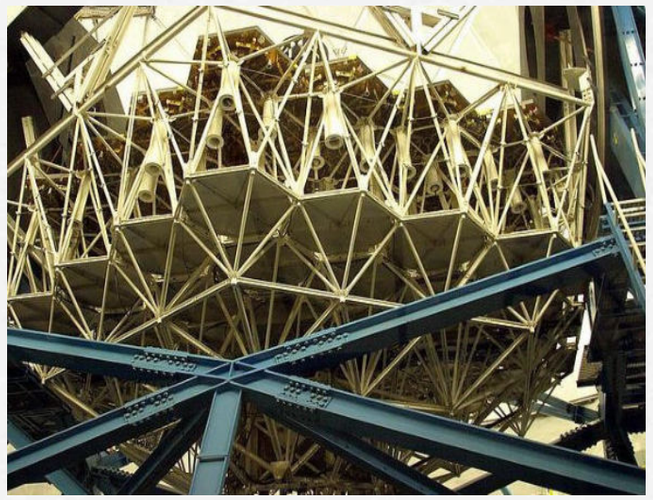




Tensegrity

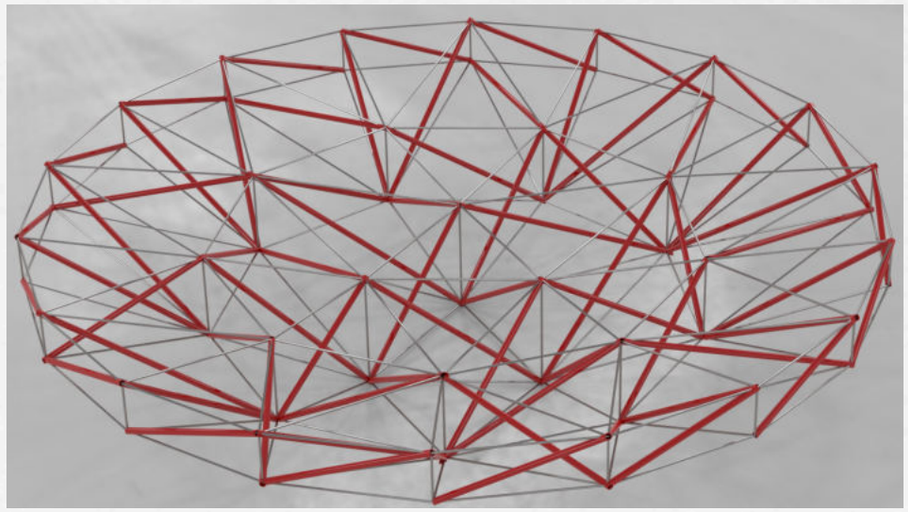
1. shear-less opto-mechanics decrease mass for large stiffness
2. Active and tunable structures decrease mass





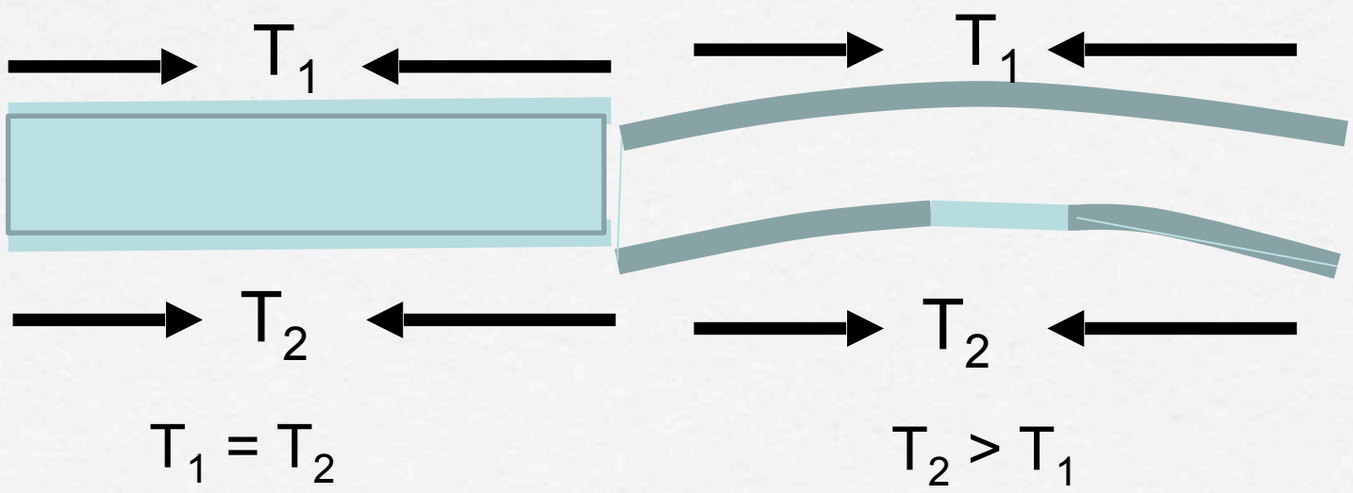
I. Joining the optical surface with the kinematic mechanical support

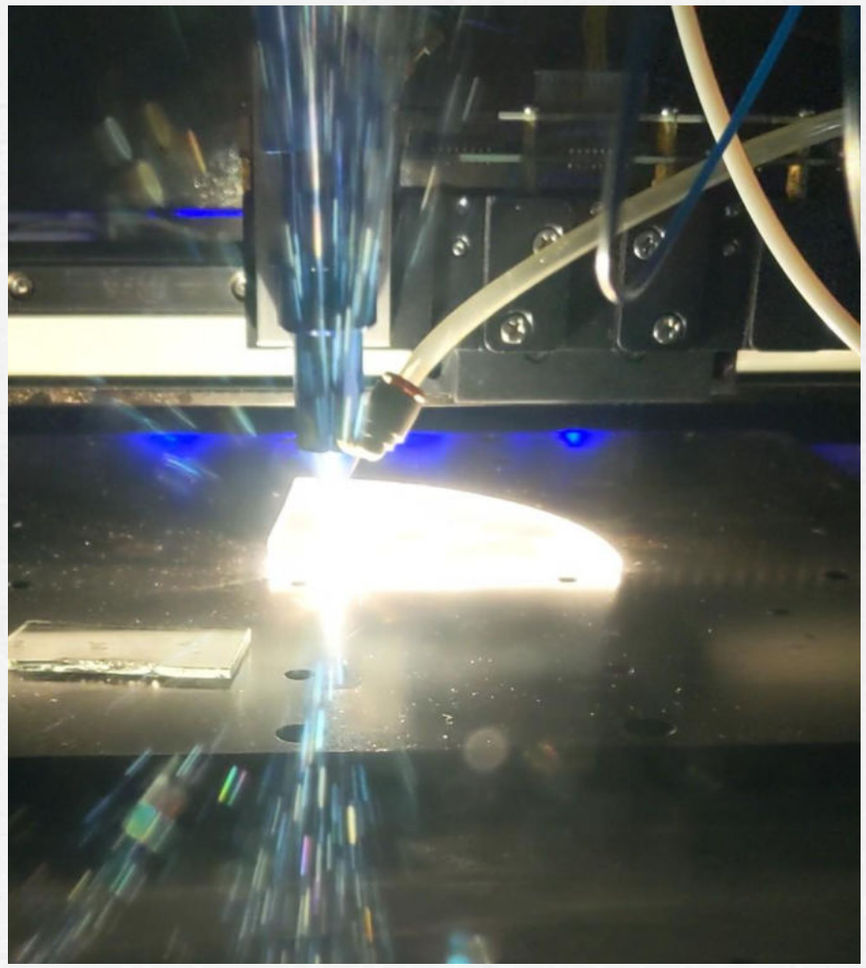
II Devising a tracker-to-payload tensegrity structure



Thin mirrors

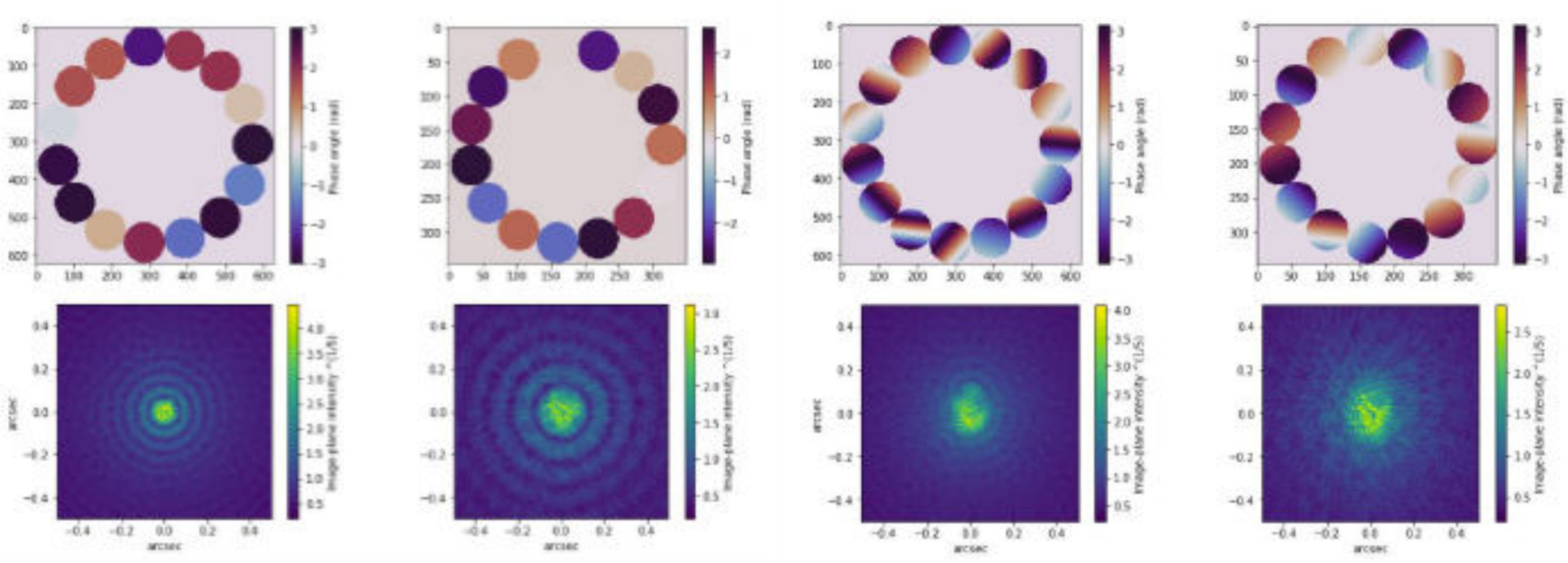
1. Low-mass propagates through full opto-mechanics
2. Curvature polishing concept minimises mirror roughness scatter
3. Dynamic curvature control with electro-active polymers allows dynamic mirror stiffness to mitigate wind and vibration perturbation





Wavefront control

1. Machine learning
2. Mach Zender
3. Astrophotonics
4. Quantum detection



Spin-off company

1. We are interested in technology collaborators. We expect to form a technology spin off company to help commercialise and apply our technologies. Talk with us if you are potentially interested in tech-business collaboration.
2. Our engineering and technology group is exploring “tech-solution`” collaborations broadly in opto-mechanics and photonics. If you have specialised technical problems in these areas, we are happy to talk with you about possible joint solutions.

Path forward

- Facilitate appropriate research and technology
- Create public awareness
- Commission Small-ELF by 2027
- Complete design of ELF by 2027
- Make LIOM @ IAC sustainable

- ✓ Public/private funding
- ✓ Create spin-off company
- ✓ Adapt technology to space

Thank you very much for your attention