

# APC 4 – Gamma Group

Focus on CTA

David Berge on behalf of the gamma-ray astronomy group

# Slide from 2018

## Scientific evaluation of previous Helmholtz funding cycle

### Strategy Gamma-Ray Astronomy

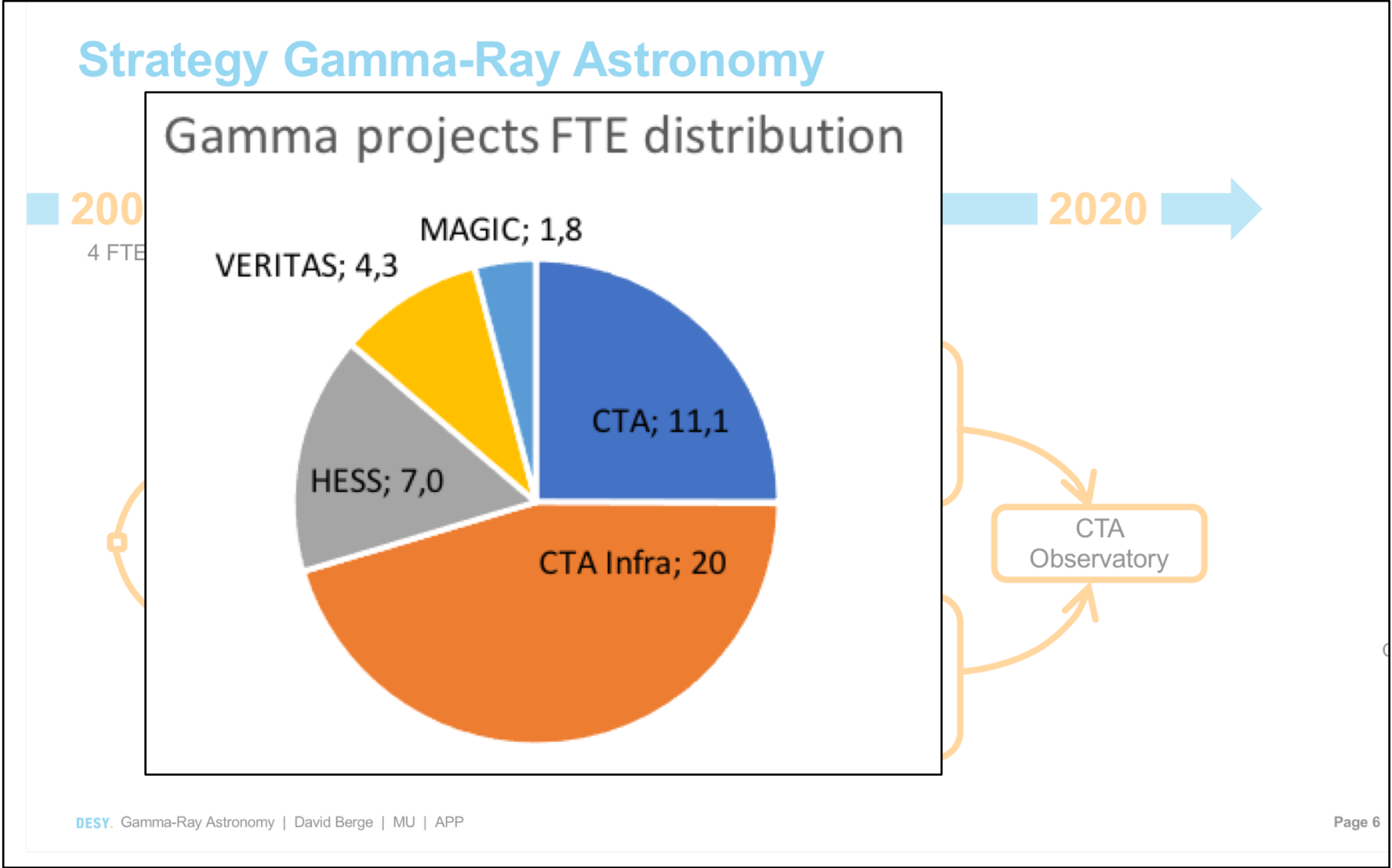


Theme then and now:  
when to focus mostly on  
CTA

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when to focus mostly on  
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# APC-3 Recommendations Gamma

## Recommendations:

- **The APC recommends to continue focusing on rationalization of CTA components with the aim of minimizing duplication and effective installation.**
- **The APC recommends continued support of the H.E.S.S. and VERITAS experiments in order to assure the scientific output important to the young researchers already at DESY, and to attract the excellent new people that will be essential for helping with CTA construction and commissioning.**



# CTA High-Level Status

## Stairway to gamma-ray heaven

- 2008: CTA enters the ESFRI roadmap
- 2010-2014: EU-funded preparatory phase
- 2014: Project Office established for pre-construction phase
- 2015: site candidates chosen, observatory close to Paranal, Chile, and La Palma, Spain
- 2016: headquarters chosen, HQ in Bologna, Science Data Management Centre in Zeuthen at DESY
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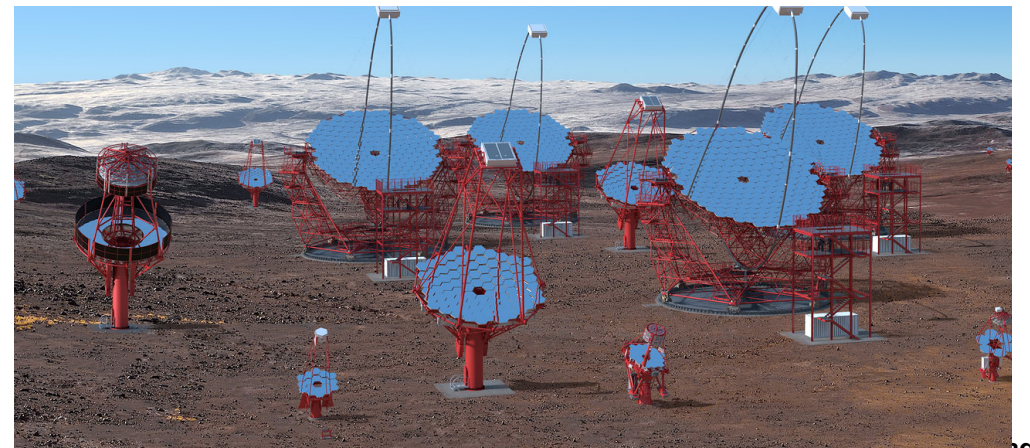
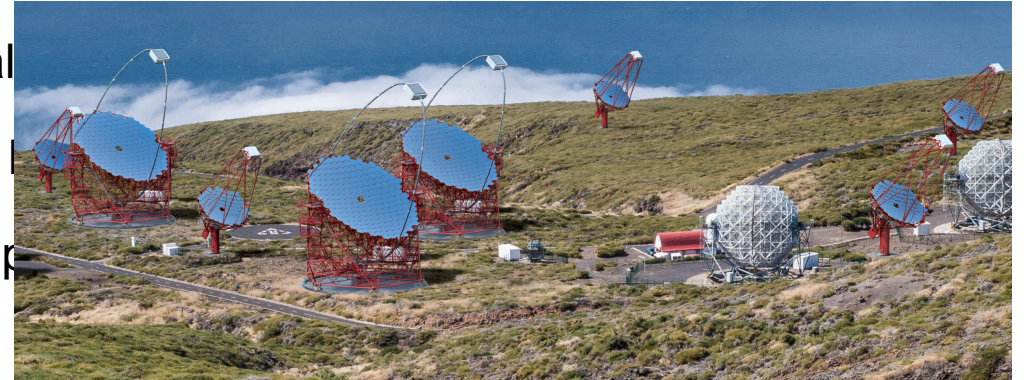
**Plenty of reasons for optimism: great science case, plenty of money on the table, all four CTAO sites established, great progress in telescope plans (MST, SST for us), etc etc**

**For the purpose of our discussion I am focussing on the challenges only!**

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# CTA High-Level Status

## Stairway to gamma-ray heaven

### How to make CTA a reality:

- 2021: foundation of ERIC (Euro. Research Infrastructure Consortium)
  - Vision meets reality: need a realistic plan including national commitments **before** ERIC documents submission
  - Available budget and observatory price tag differ by 25%
  - One way of describing the funding situation: telescopes could be built and provided in-kind, part of the software needed probably too, central cash for observatory (infrastructure and people) most problematic
- 2021 – 2025: construction, commissioning, science verification
- 2025 onwards: first user operations

**ERIC on critical path, everything else will shift with ERIC foundation delays**

# More on the CTA cost challenge

CTA Project Manager

		Cost Area	% of total	Foreseen as IKC	Remark
<div>Partial Cash</div> <div>100% Cash</div>		Telescopes	48.8%	98.6%	
		CTA-S Infra & On-Site	18.2%	0.0%	For 65 telescopes
		Computing	16.2%	61.0%	
		CTA-N Infra & On-Site	4.7%	53.2%	For 9 telescopes
		Array Common Elements	2.7%	70.1%	
		Science & SciOps Prep	2.5%	37.8%	
		Administration	2.1%	0.0%	
		Site/Infra Design	1.6%	40.0%	
		Systems Engineering & Integration	1.2%	0.0%	
		Director's Office	1.0%	0.0%	
		Project Management	0.9%	0.0%	

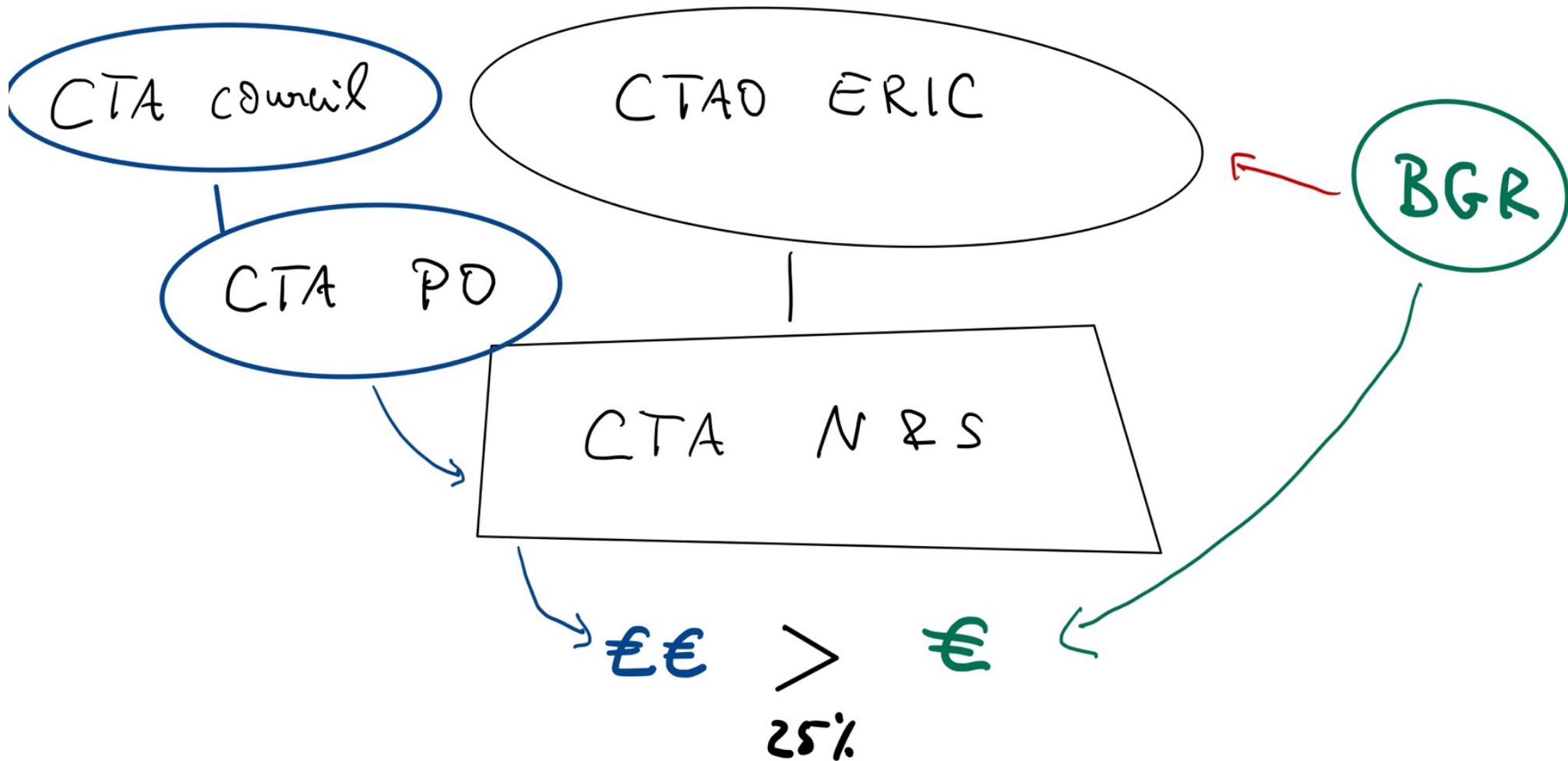


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Site/Infra Design	1.6%	40.0%	
Systems Engineering & Integration	1.2%	0.0%	
Director's Office	1.0%	0.0%	
Project Management	0.9%	0.0%	

# The CTA organisational challenge



Actively working on our own ministry to help with this



# DESY CTA In-Kind Contributions – Presence

- DESY provides 17% of German CTA contributions, 27% including ministry funding ('Cost Book' items)
  - German CTA contributions total 26% overall
- Medium-Sized Telescopes (MST) – DESY leading telescope structure project, MST (tel + cameras) about half of German CTA contributions
- Small-Sized Telescopes (SST) – DESY partner in camera project, led by Germany
- ACADA – online software project, DESY biggest contributor
- Monte Carlo simulation pipeline, DESY + Max-Planck Heidelberg (MPIK)
- Open question for us here: shall we do more, at the expense of current-generation instruments?

# DESY CTA In-Kind Contributions – Future?

- We are considering increasing our Computing contributions since this is the one big open (unassigned) chunk
- We have already investigated further contributions, in areas of (science) software development and architecture, online software and testing (both connecting well to our current efforts in ACADA)
  - Up to **6 FTE in addition** needed
  - If we have to be Gamma-FTE-neutral, we would need to pull this out of HESS / VERITAS / MAGIC (currently ca. 7 / 4 / 2 FTE)
- ... the budget hole is clearly bigger than this, we are actively engaged in trying to get us over the final ‘cliff’

# H.E.S.S. and VERITAS – do or die?

- Essential DESY contributions in both collaborations (operations, cameras, simulations, reconstruction, leadership roles, etc etc)
- Both still do interesting science
  - H.E.S.S. only Southern hemisphere imaging instrument
  - See recent GRB afterglow measurements, intensity interferometry, AGN measurements, EBL, etc etc
- Heavy duty for some of us, but also lots of opportunities for PhD students and postdocs
  - We do face efficiency problems in that both collaborations lack person power!

H.E.S.S. submitted to Science just now

Striking Similarities of Spectral and Temporal  
Behaviour in a GRB Afterglow Between X-rays and  
Gamma-Rays

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Letter | [Published: 20 July 2020](#)

## **Demonstration of stellar intensity interferometry with the four VERITAS telescopes**

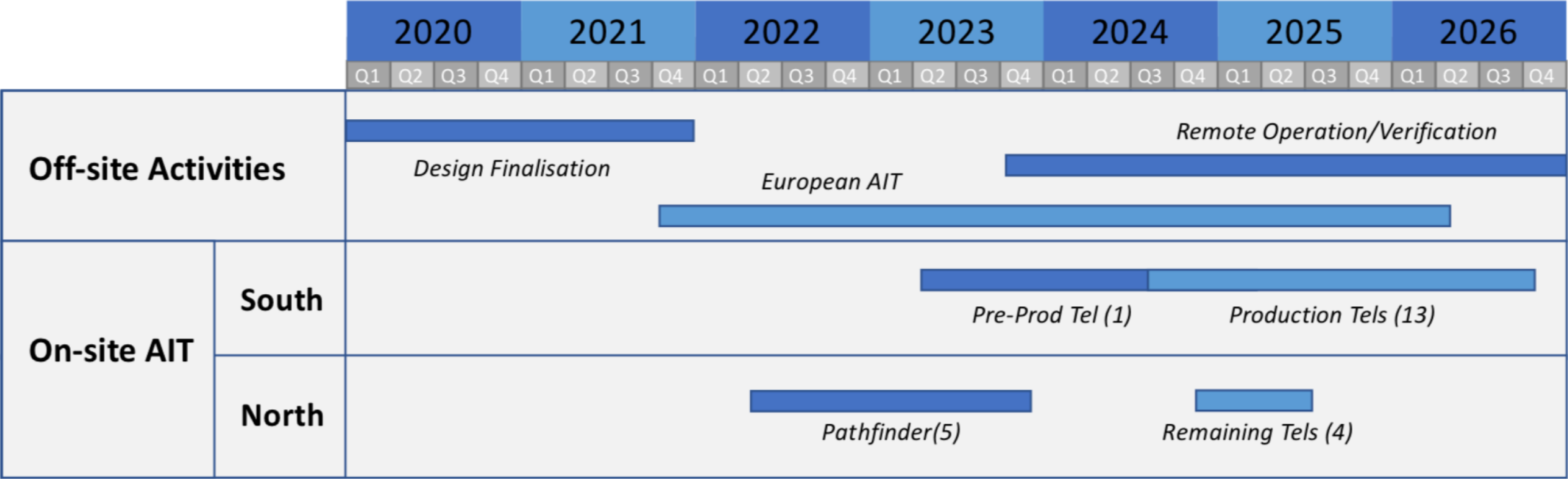
[A. U. Abeysekara](#), [W. Benbow](#), [...] [T. J. Williamson](#)

[Nature Astronomy](#) (2020) | [Cite this article](#)



# MST

Successful push by us and others to establish a real plan



Busy preparing reviews, negotiating telescope numbers, pathfinder (La Palma) telescope positions...

# SST

## Programme on its way

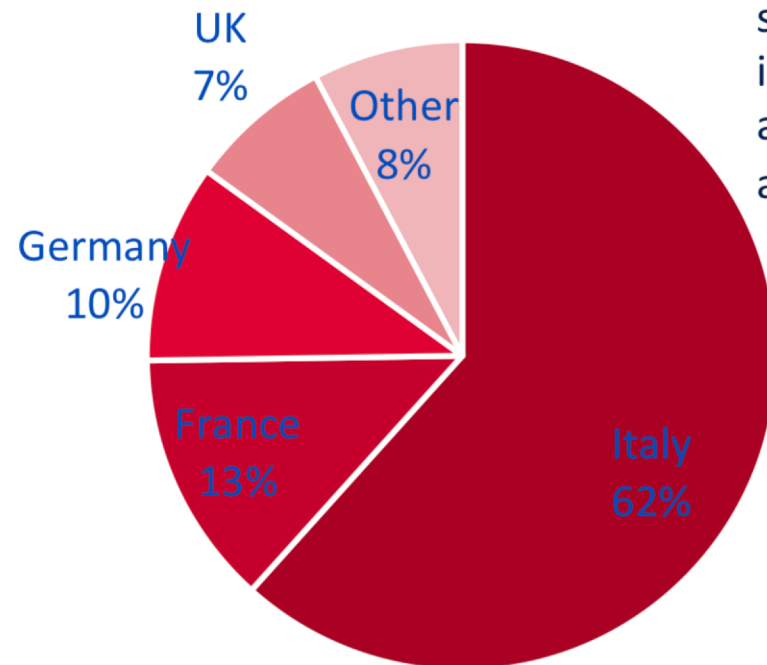
- Project harmonisation successful, went from 3 to 1 proposed designs
- Currently planning implementation, prepare further reviews, negotiate telescope numbers...

Country	Stakeholders
Italy	INAF
France	Observatoire de Paris / CNRS
Germany	MPIK DESY U. Erlangen (ECAP)
UK	U. Leicester U. Liverpool U. Oxford U. Durham

Country	Stakeholders
Brazil	U. São Paulo
Japan	U. Nagoya
Australia	U. Adelaide <sup>1</sup>
Netherlands	U. Amsterdam
South Africa	North West U.
Switzerland	U. Geneva, Dept. of Astronomy

+ possibly NARIT (Thailand)

Table 1: Anticipated SST Partners.



One plausible sharing scenario if pending funding applications are successful



# ACADA and MC simulations