CTAO
Cherenkov Telescope Array Observatory

CTAO: The Upcoming VHE γ-ray Observatory

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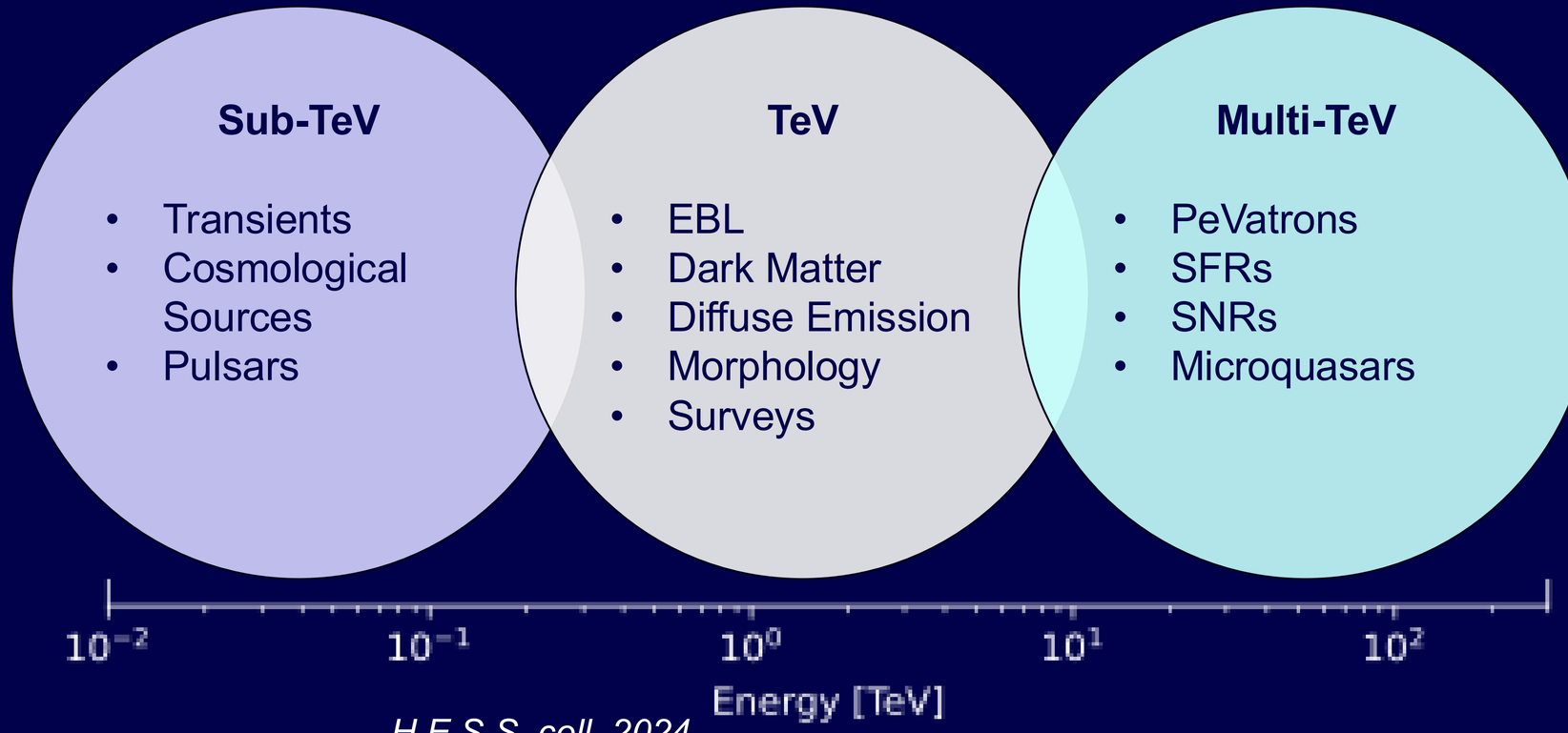
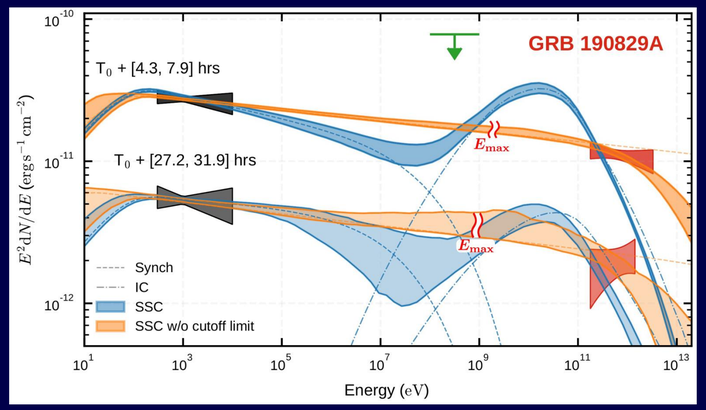
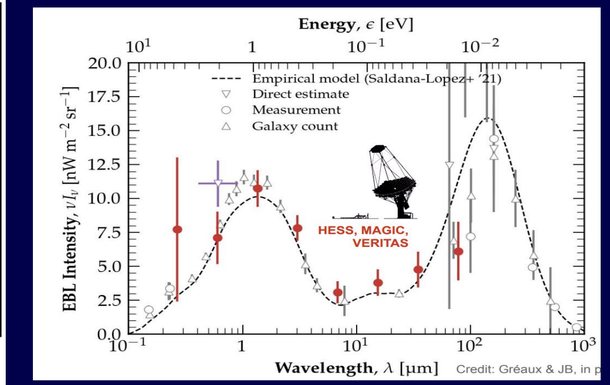
CTAO Science

- I am not going to go into details on the Science for CTAO
- CTAO will have lots of science potential
- Will produce the largest catalog of VHE sources
- Will be a cornerstone of MM+MWL Science
- See Gabrijela's talk



H.E.S.S. coll. 2021





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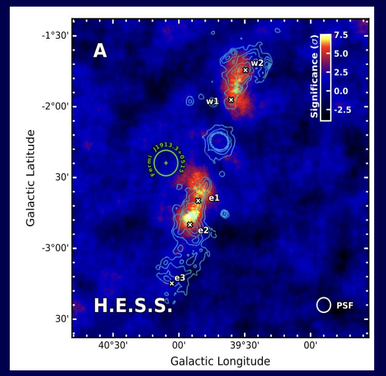
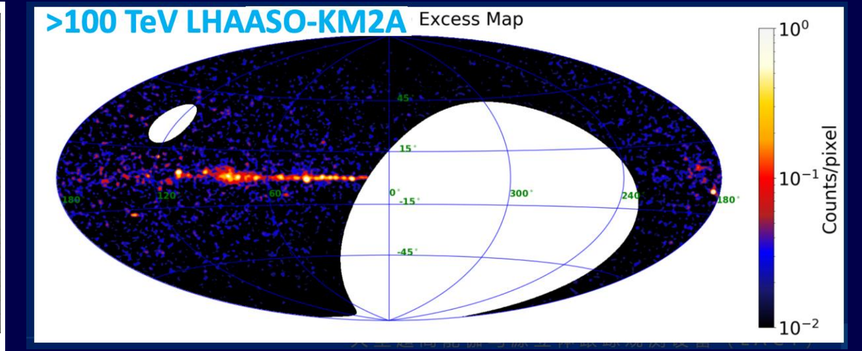
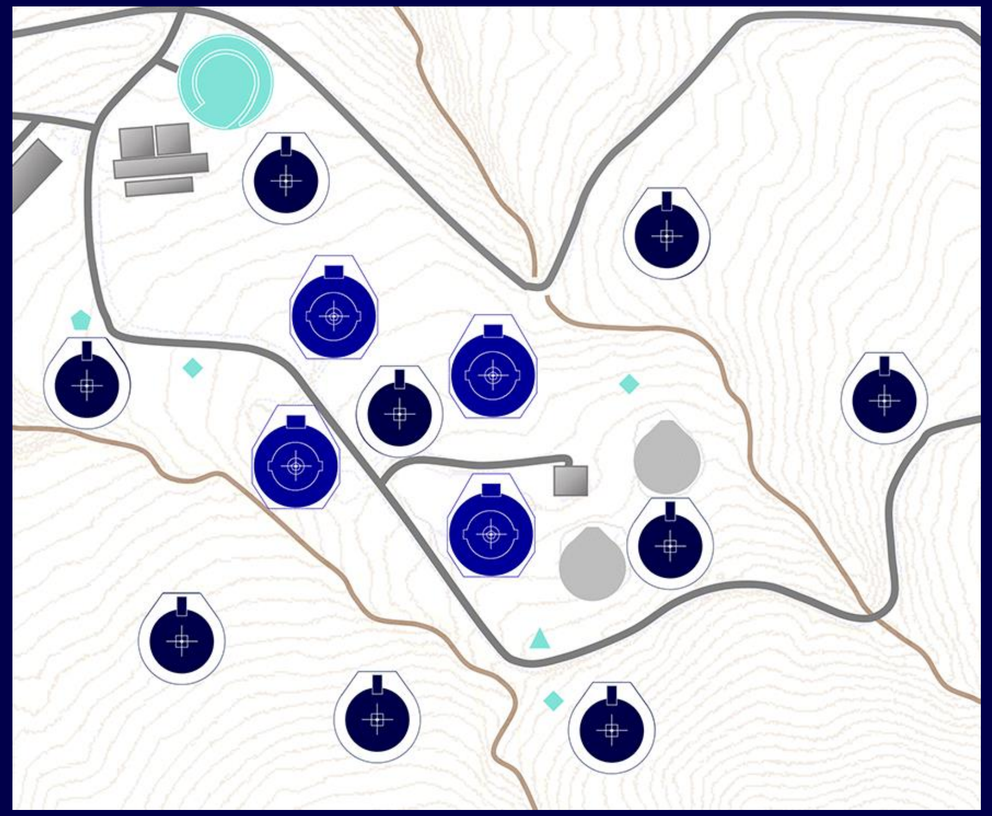




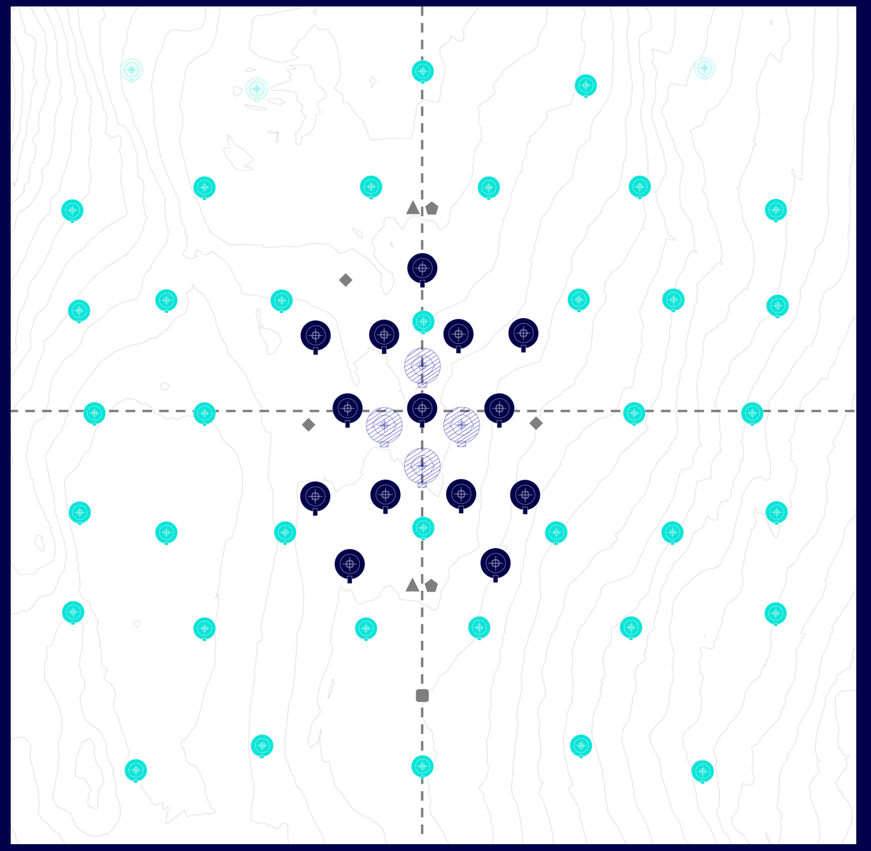
CTAO Sites

Alpha Configuration

CTAO Northern Array

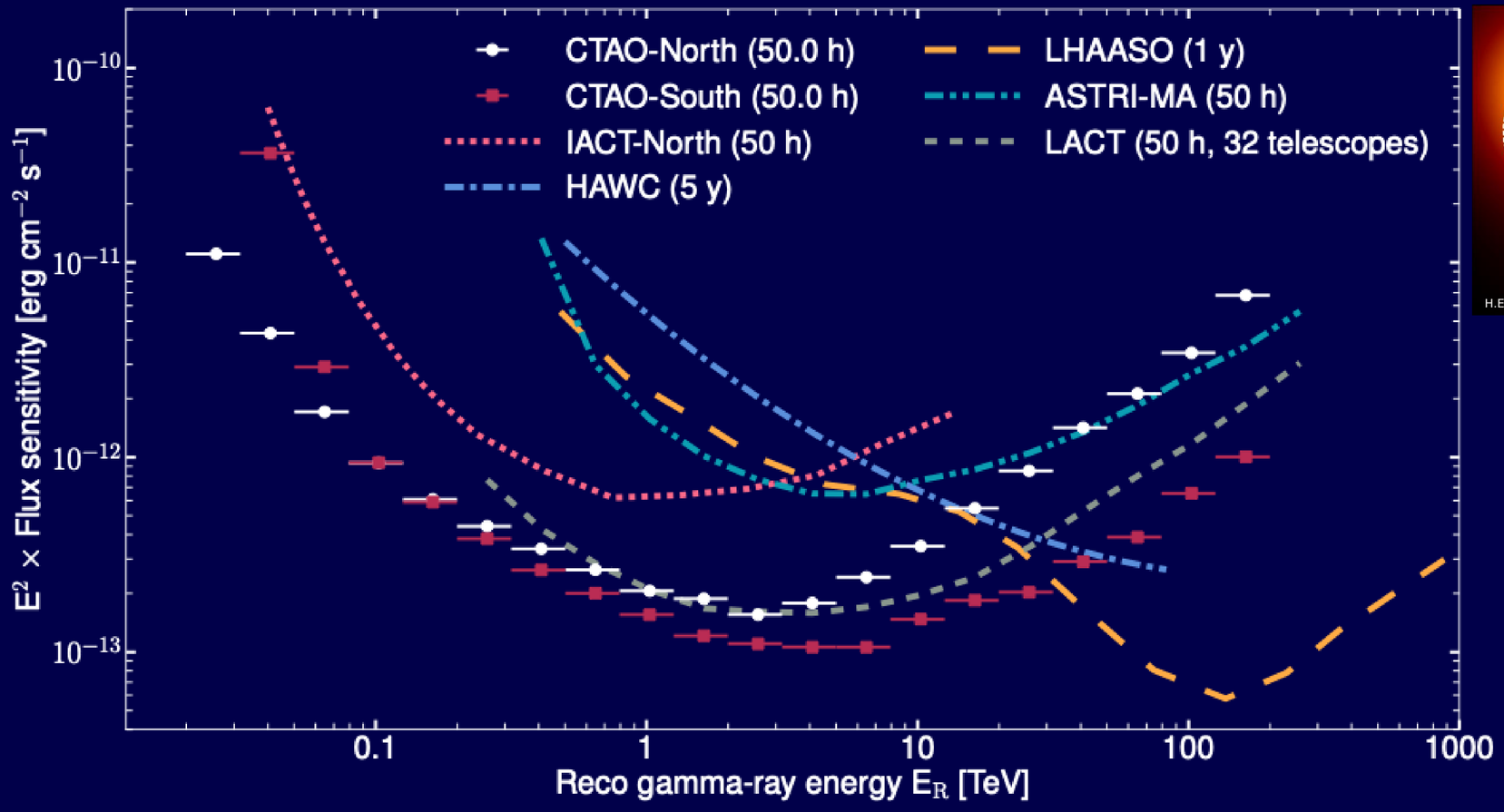


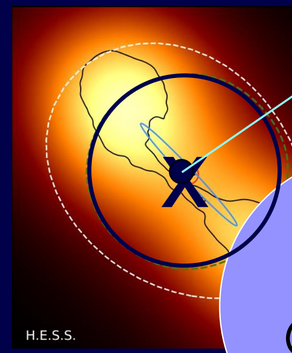
CTAO Southern Array



CTAO Performance

Alpha Configuration





15-30” localization

ASTRI 10 TeV

CTAO 2 TeV

LAT @10GeV

HAWC @10TeV

LHAASO @30 TeV

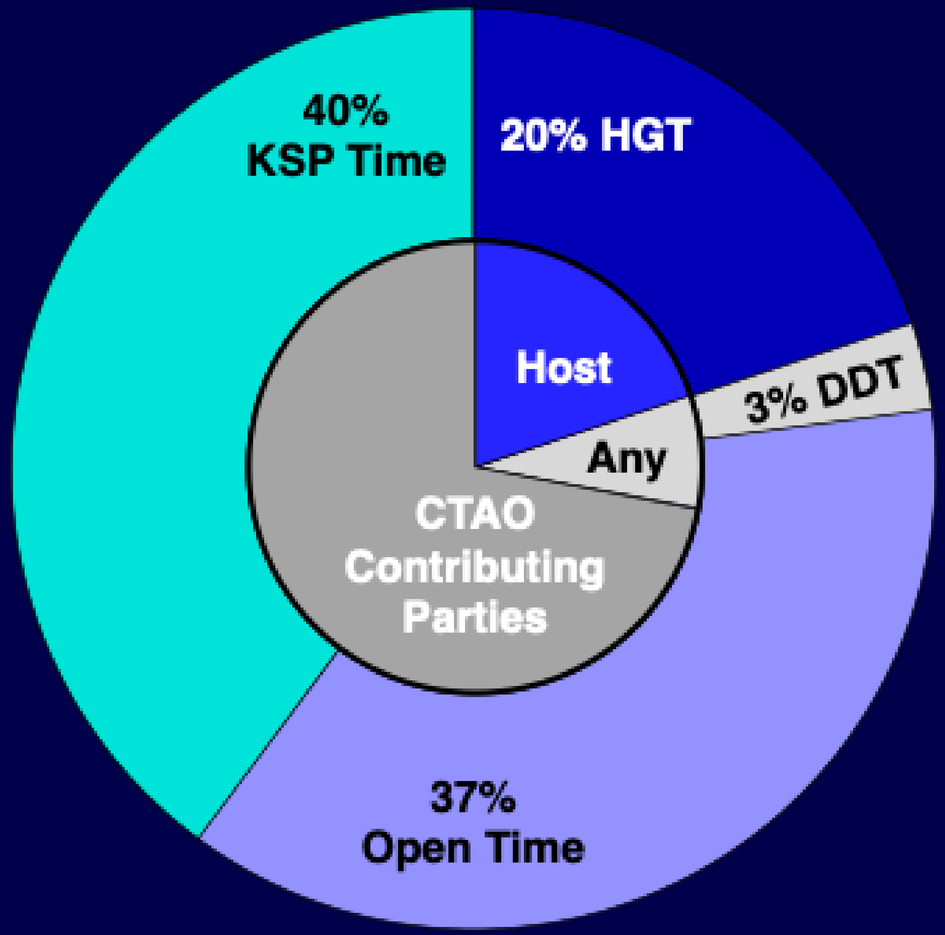
SWGO @10TeV

Types of Observing Time

An open proposal-driven observatory

- Proposals will be evaluated on their scientific merit in a double-blind fashion
- Data will have a proprietary period of 1 year
  - After which the data will be public
- 8% of time is for any scientist either through DDT or Open Time

- HGT – Host Guarantee Time (Spain, Chile, ESO)
- DDT – Director's Discretionary Time
- KSP – Key Science Projects



Integrated over 10 years

CTAO Timeline

IKC Construction

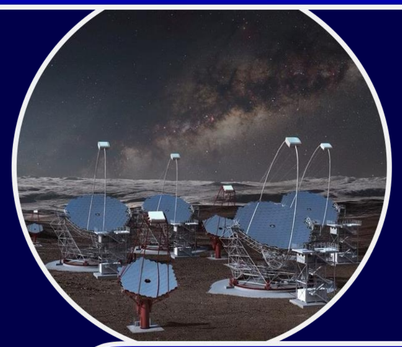
- Telescopes
- Array Common Elements
- Commission of array elements
- CTAO software

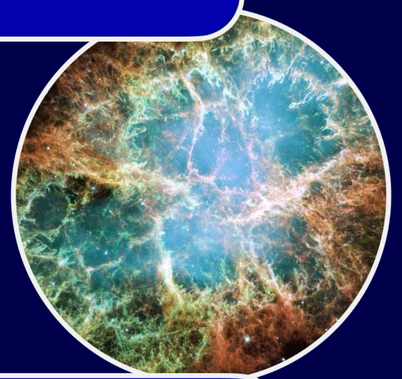
Array Commissioning

- Integration, verification, and validation of array elements and software
- Science verification of intermediate array configurations

CTAO Construction

- Infrastructure





Early Science

- Call for proposals
- Guaranteed observing time for Contributors to construction project

Steady State Operations

- Full Alpha configuration
- Normal Operations begin
- KSP begins

Now | 2027 - 2028 | 2028 - 2030 | 2030+

Credit: David Sanchez & CTAO-LST Collab

July 2025

Towards first CTAO data

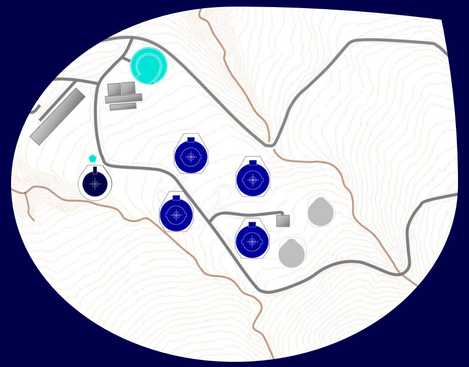
Intermediate array configurations

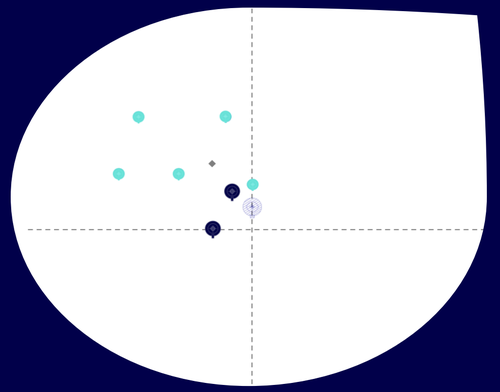
- Incremental array configurations that become progressively available to community
  - Array elements fully integrated with the intermediate release of software packages
  - Array elements include telescopes but also calibration devices and atmospheric characterization instruments

- Mid-period plan (~3 years) based on the construction and acceptance schedule
  - Built accounting for the inputs of the in-kind contribution teams

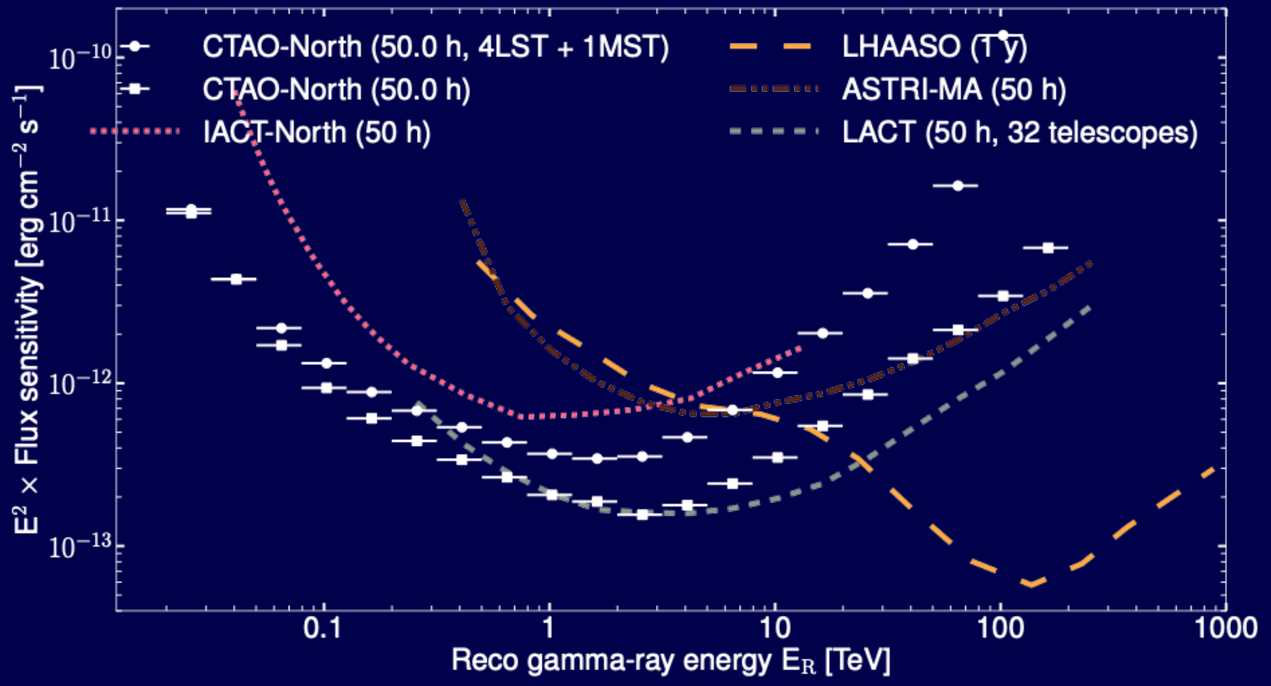
1st Intermediate Arrays

3 years from today

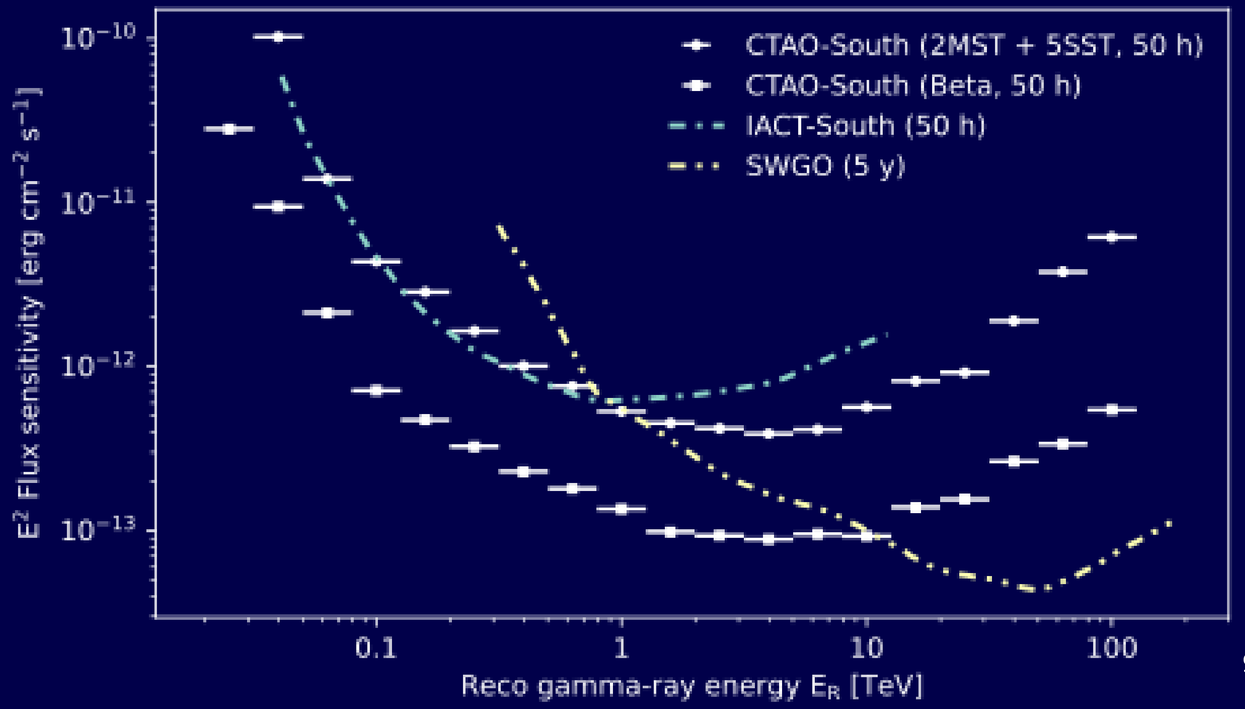




CTAO-North



CTAO-South

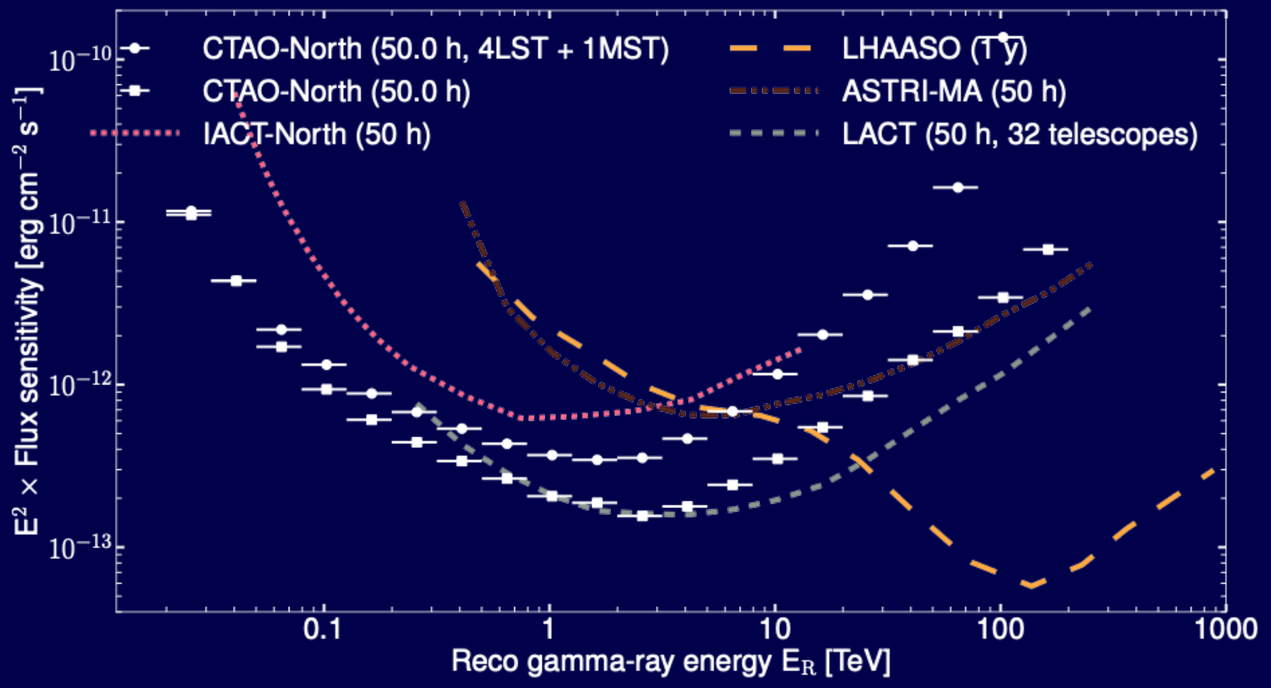


1st Intermediate Arrays

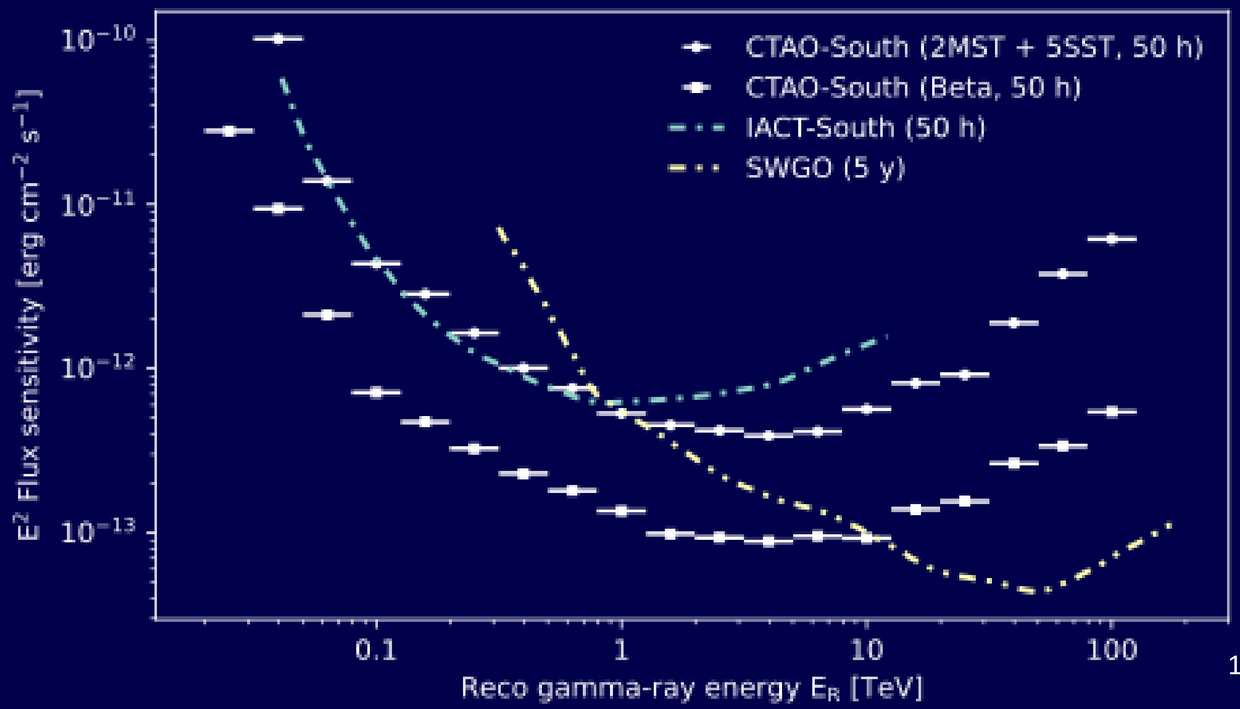
- Intermediate array configurations should be available in 2028
  - CTAO Central Office is working closely with IKC teams

- CTAO-North -> 4 LST + 1 MST
- CTAO-South -> 2 MST + 5 SST
- More news hopefully to come soon

CTAO-North



CTAO-South



Early Science Timeline

Early Science OP 1

- **4x LST 1x MST**
- Observatory Release 2
- Verified in 2028
  AO Call in 2029
- **2x MST 5x SST**

Early Science OP 2

- **4x LST 5x MST**
- Observatory Release 3
- Verified in 2029
  AO Call in 2030
- **TBD**

Early Science OP 3

- **4x LST 9x MST**
- Observatory Release 4
- Verified in 2030
  AO Call in 2031
- **14x MST 37x SST**

OP1

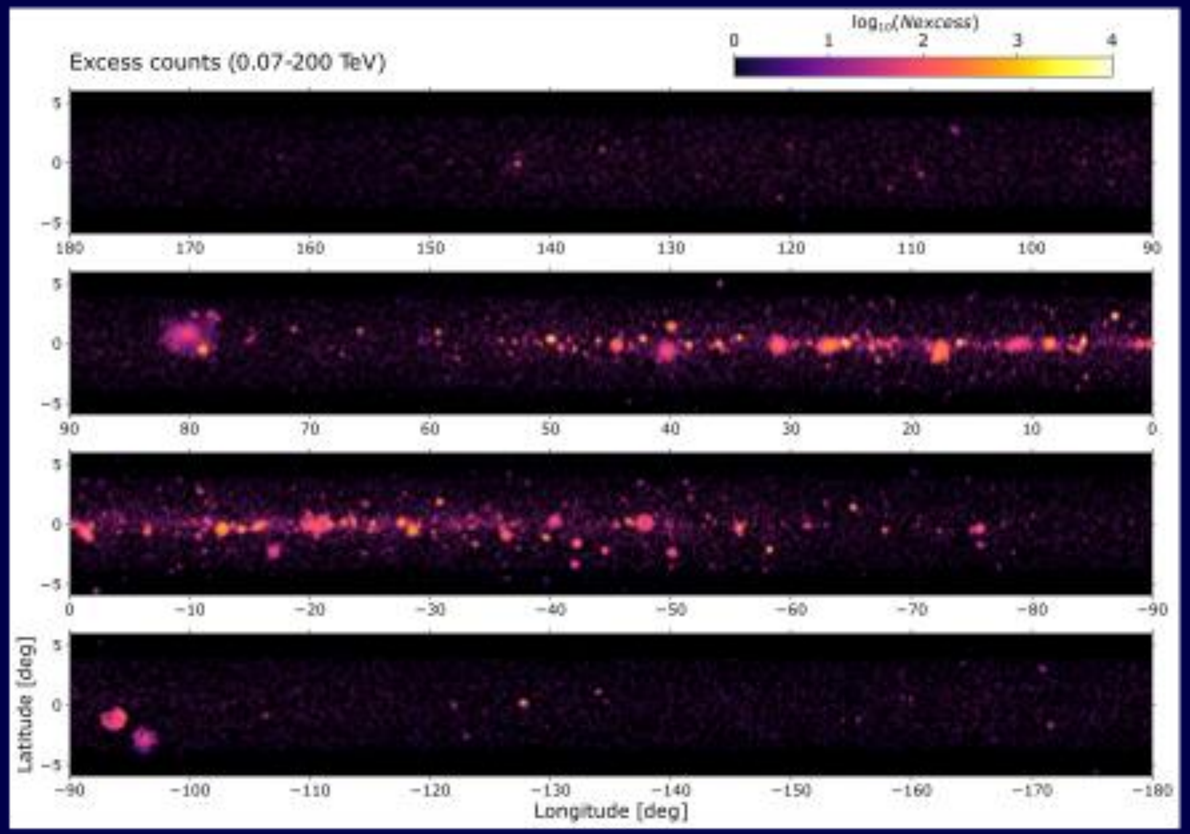
- **4x LST 9x MST**
- Official Start of Operations
- AO Call in 2032
- **14x MST 37x SST**

2028 2029 2030 2031 2032

Science Data Challenge

Fully open and blind!

Seven years of simulated CTAO observations provided as science-ready datasets



Goals:

- Allow the scientific community to explore CTAO Scientific capabilities
- Allow users to become familiar with the technicalities of the analysis as well with the CTAO SAT/Gammapy
- Good opportunity to learn Gammapy

Release of Science Data Challenge Q4 2026

CTAO SCHOOL

Welcome to the 2026 Edition!
The school will run from **12 to 22 May**, and is designed for **PhD students and postdoctoral researchers** eager to begin or further explore CTAO **science, technology, and data analysis.**

See you in La Palma, Spain

2026

- Focus of school is on Time-domain astrophysics and Galactic science
- Partnering with MAGIC through ACME to reach beyond CTAO
- Application deadline is November 30th!
- https://school.ctao.org/ for more details

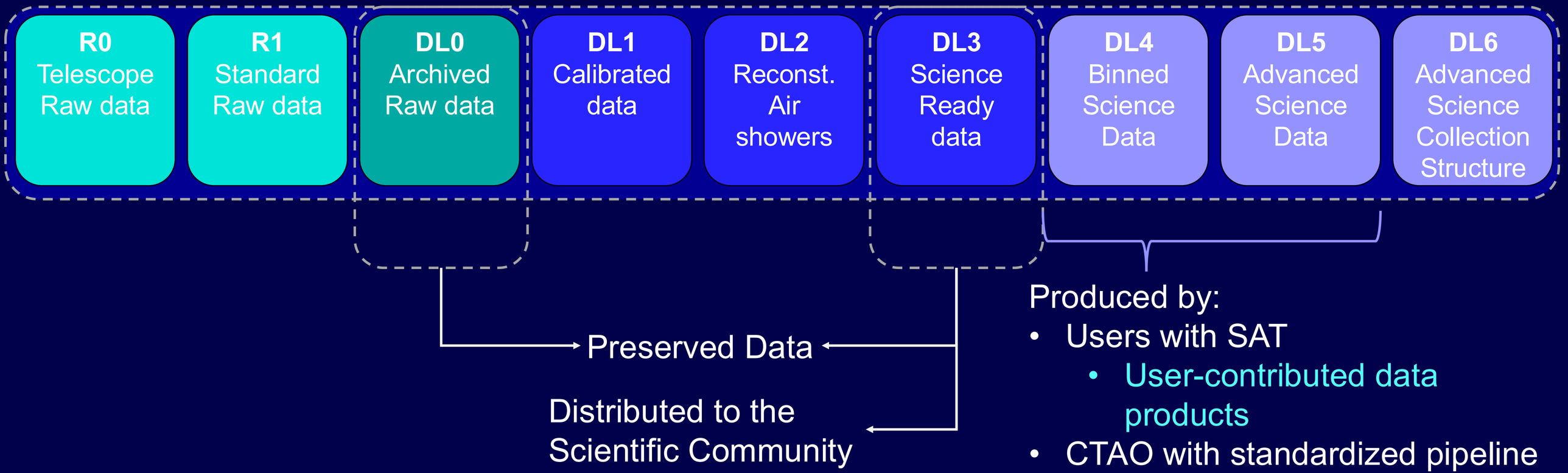
Conclusions

- **VHE gamma-ray astronomy is a key discipline within the broader field of astrophysics**
- **CTAO** will be the first proposal driven open astronomy observatory in the field of VHE astronomy
- The scientific community will have the possibility to request observing time and to access the data (after a one year of proprietary period)
- **CTAO** is set to become a **cornerstone** of mutli-messenger and mutli-wavelength (MM/MWL) astronomy
- The construction of the **CTAO project** has already started! First data is coming soon.

Backup Slides

Data Levels

CTAO will offer a storage service on selected DL6 data (e.g., catalogs)



Produced by:

- Users with SAT
  - User-contributed data products
- CTAO with standardized pipeline
  - Observatory data products for quick-look results

Data Categories

CAT-A data Realtime analysis	CAT-B data On-site analysis	CAT-C data Off-site analysis
Latency	Within the same observing night	Next day (before the start of the next observing night)	1 month after observation
Goal	Issue Scientific alerts and follow-up observations	Data quality and check of CAT-A results	Delivery of best quality data for scientific analysis == used in publications

Performance Requirements in terms of systematic uncertainties