Cherenkov Telescope Array Observatory: possible synergies on proposal handling, observation planning and data dissemination

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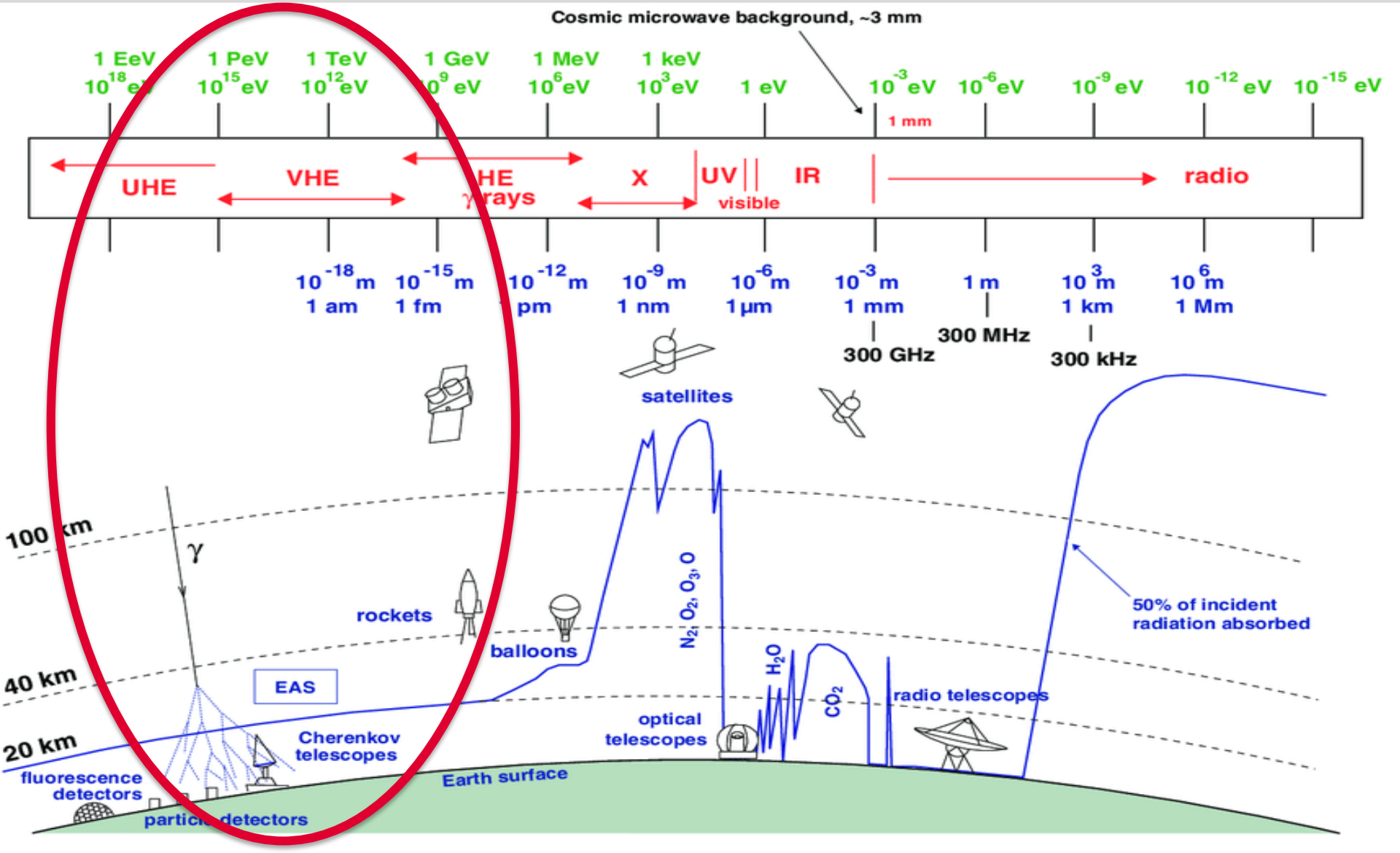
RIA – October 24, 2023

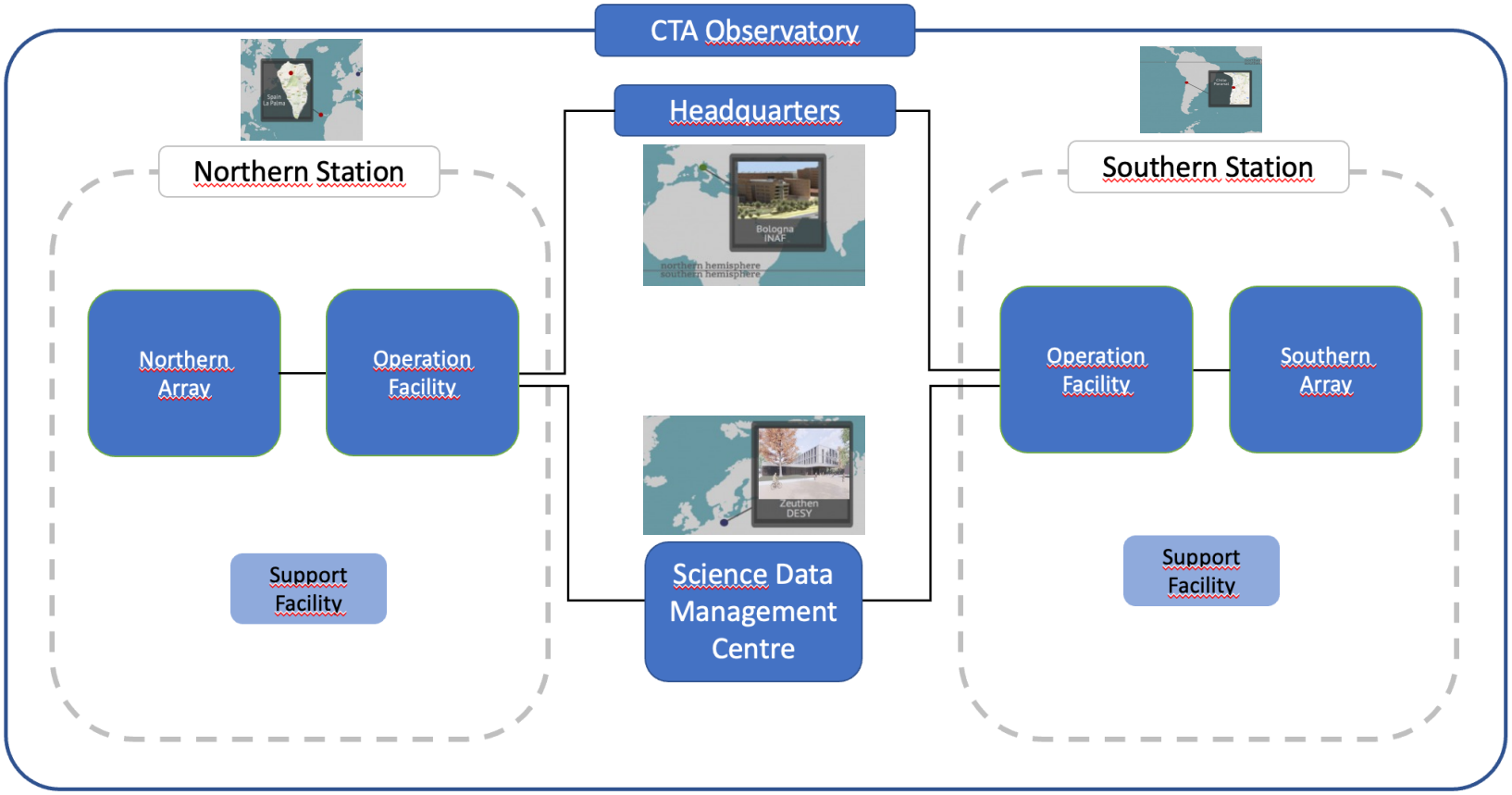
cherenkov telescope array

PART I:
Cherenkov Telescope Array Observatory

Gamma rays join astronomy

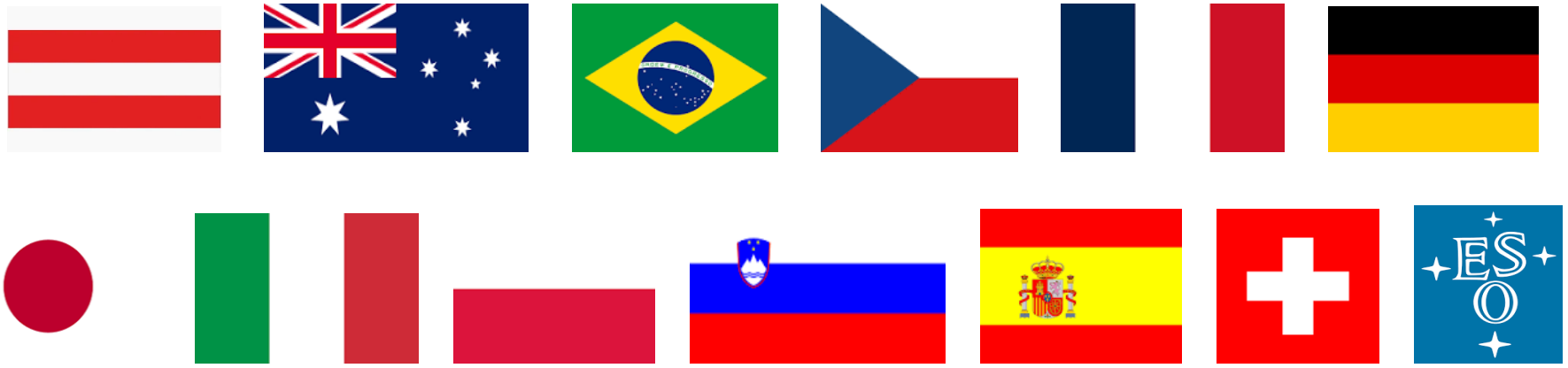


CTAO: a distributed observatory



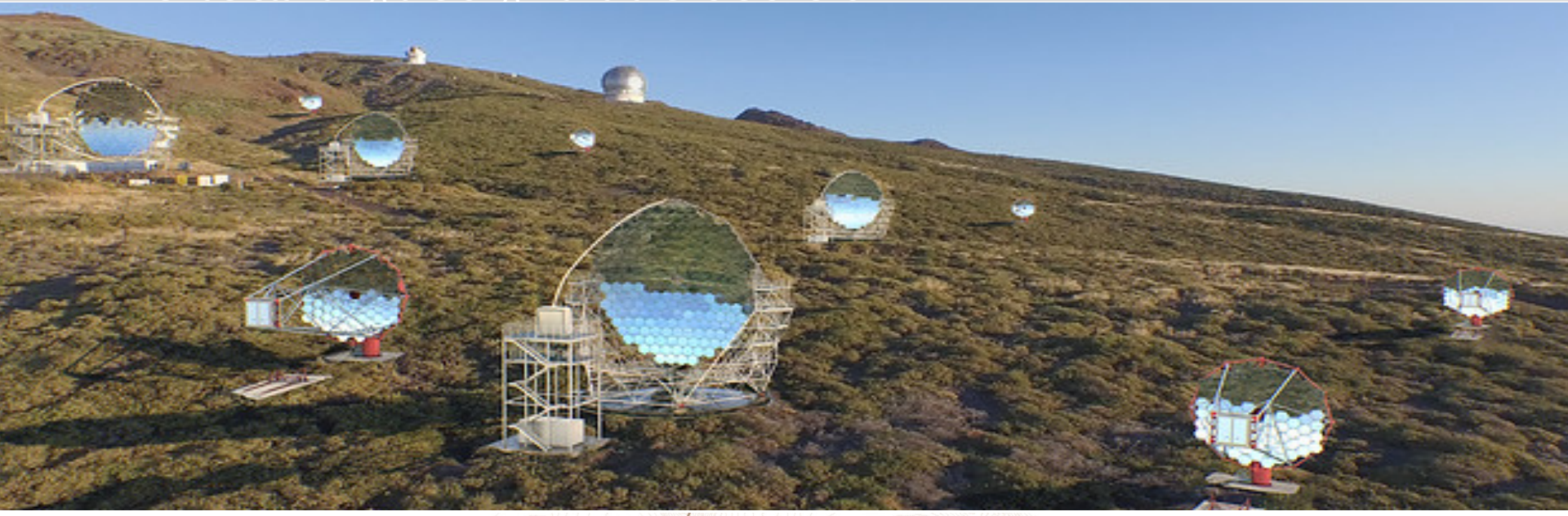
CTAO: an international facility

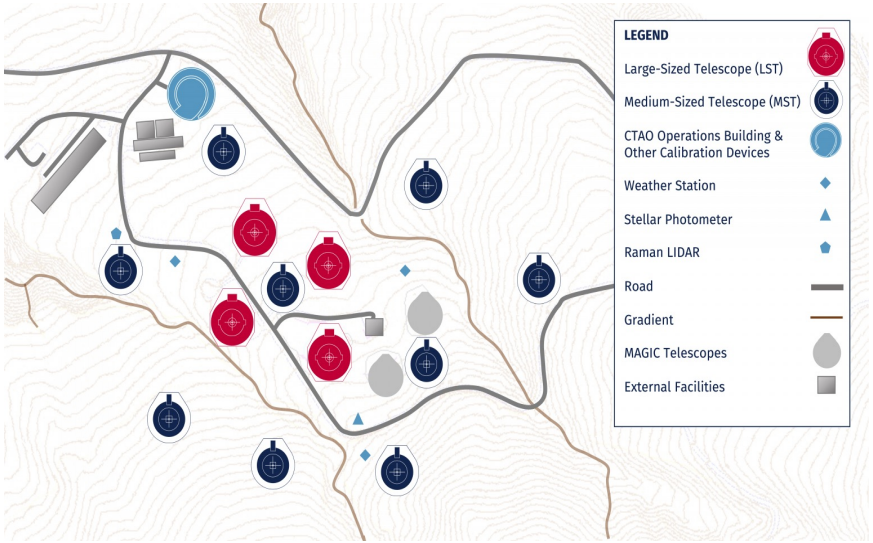
Contributing parties (CP): 12 countries + 1 IGO



Spain contributes to 12,5 % of the overall construction project

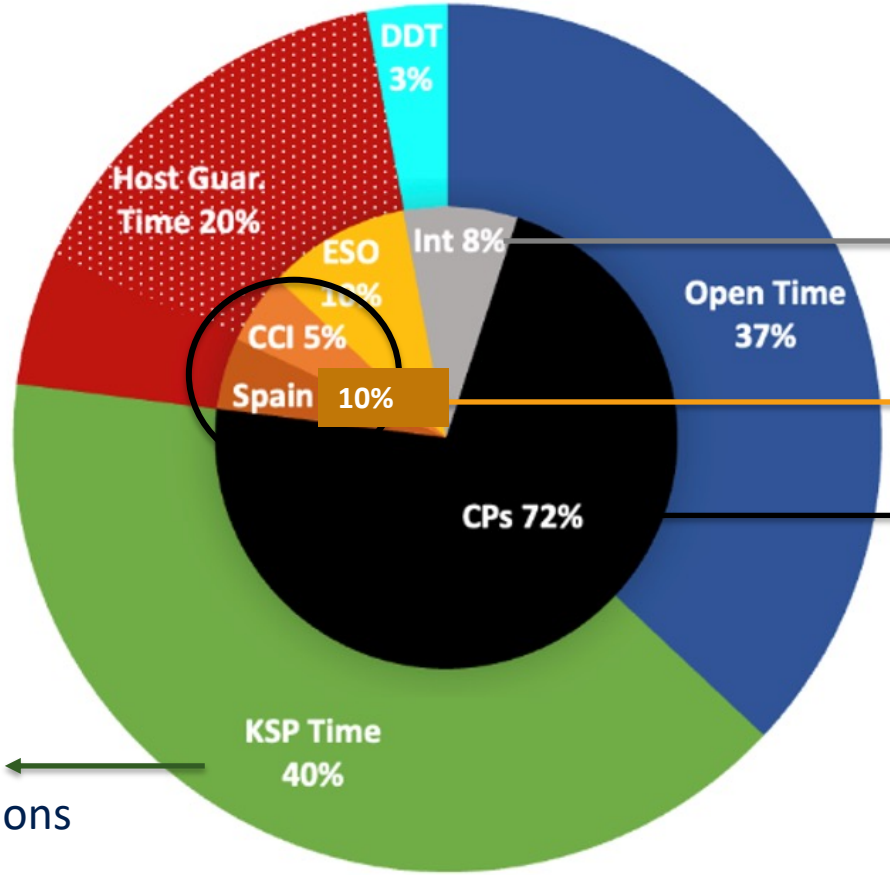
CTAO Northern Array @ORM





CTAO observing time

Observing time distribution for CTAO Northern array integrated over 10 years



no access restrictions

access to Spanish institutions

access to contributing parties

GTOs as reward for in-kind contributions

cherenkov telescope array

PART II:
possible synergies on proposal handling, observation planning and data dissemination

The proposal lifecycle

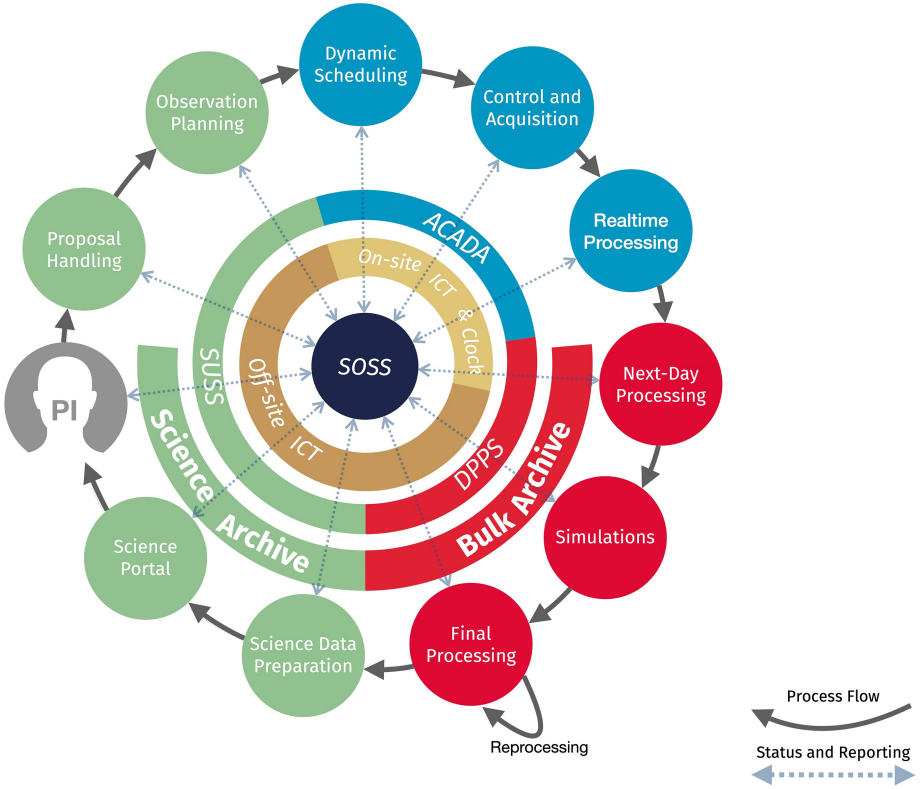
REQUESTING OBSERVING TIME

OBSERVATION PLANNING

DATA TAKING

DATA PROCESSING

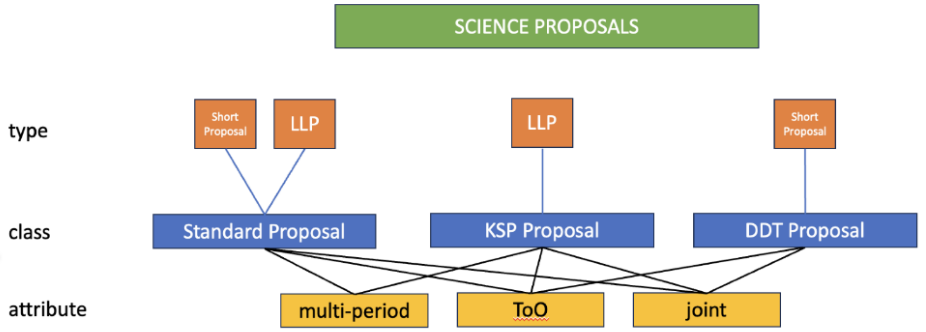
DATA DISSEMINATION



Requesting observing time

ANNOUNCEMENT OF OPPORTUNITY CALL (1/yr)

PROPOSAL PREPARATION



PROPOSAL SUBMISSION

- proposal handling system within the science portal
- most likely web interface

PROPOSAL EVALUATION

- dual-anonymous peer-review process

PROPOSAL RANKING

- ranking derived from the averaged grade per science target
- in addition, each science target is assigned with a time criticality

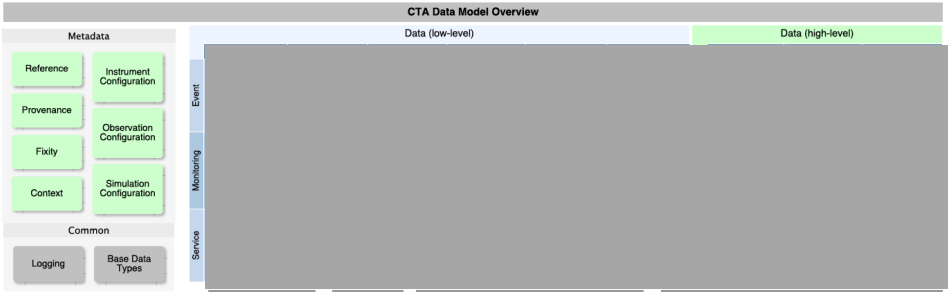
Requesting observing time

DISCUSSION POINTS

1. With the ultimate goal of broadening the synergies among the Spanish facilities, we should try to fix technical details that will make joint observation programme easier to be handled by the respective science operation teams

→ **let's agree at least on the fields and the metadata that appear in the proposal forms**

!!! The primary use case would be the CCI time and its ITP !!!



Planning observations

LONG-TERM SCHEDULE
(full observing period ~ 1 yr)

1. creation of **the list of scheduling blocks**
2. compute the amount of **observing time for ToOs** on average, and remove it from total available time
3. **allocate the SBs** optimization based on a global paramter that is derived from the ranking, time criticality and completeness
4. **oversubscription** necessary

MID-TERM SCHEDULE
(one lunar cycle)

1. every lunar cycle the LTS for those 28 days is revisited correcting for unexpected downtimes, taken observations..
2. every night the MTS is revisited to account for ToOs, in future also weather forecasts

SHORT-TERM SCHEDULE
(one night)

1. dynamic schedule integrating ToO in real time and change of weather conditions

Planning observations

DISCUSSION POINTS

1. under discussion the possibility to make the **short-term schedule publicly available** and update it to account for ToO (latency TBD) aiming for the best possible MWL coverage

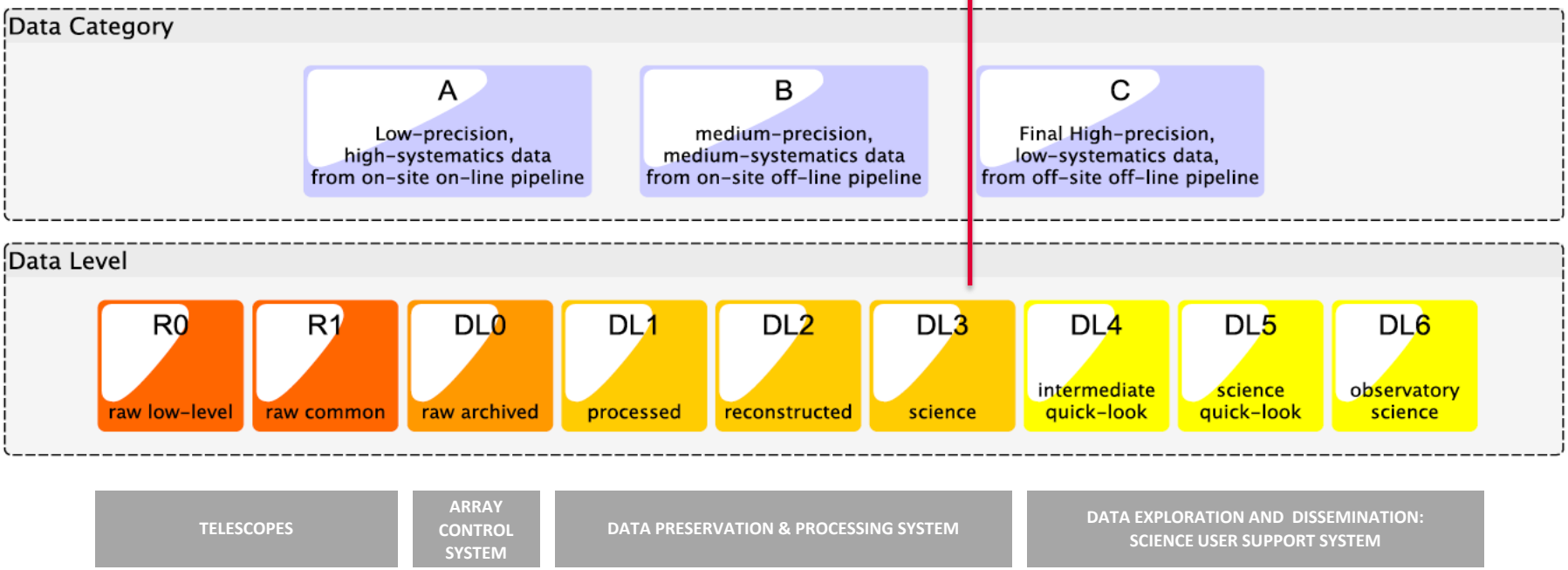
2. we should certainly make the **pointing coordinates** public among the ORM facilities to allow for a correct functioning of the **Laser Traffic Control System** (even more relevant in close future when the GCT will start ops with adaptive optics)

3. schedule sharing calls for **standards**
--> Observation Locator TAP (IVOA) provides data model + method to run queries?

4. **reliable weather forecasts** at the ORM would improve significantly the reliability of the MTS (see talks on …)

Top-level data model

science-ready data + science analysis tools



a distributed datacenter orchestrated by the SDMC

↓

4 datacenters: one of which is PIC

VODF
very-high-energy open data format

https://vodf.readthedocs.io/en/latest/index.html

Data exploration & dissemination

SCIENCE ANALYSIS TOOLS

OBSERVATORY RESULTS

- quick look results available for all data categories (different timescales)

STORE USER-CONTRIBUTED RESULTS

- DL5 and DL6

USER SUPPORT

- helpdesk
- knowledge database
- training events

Data exploration & dissemination

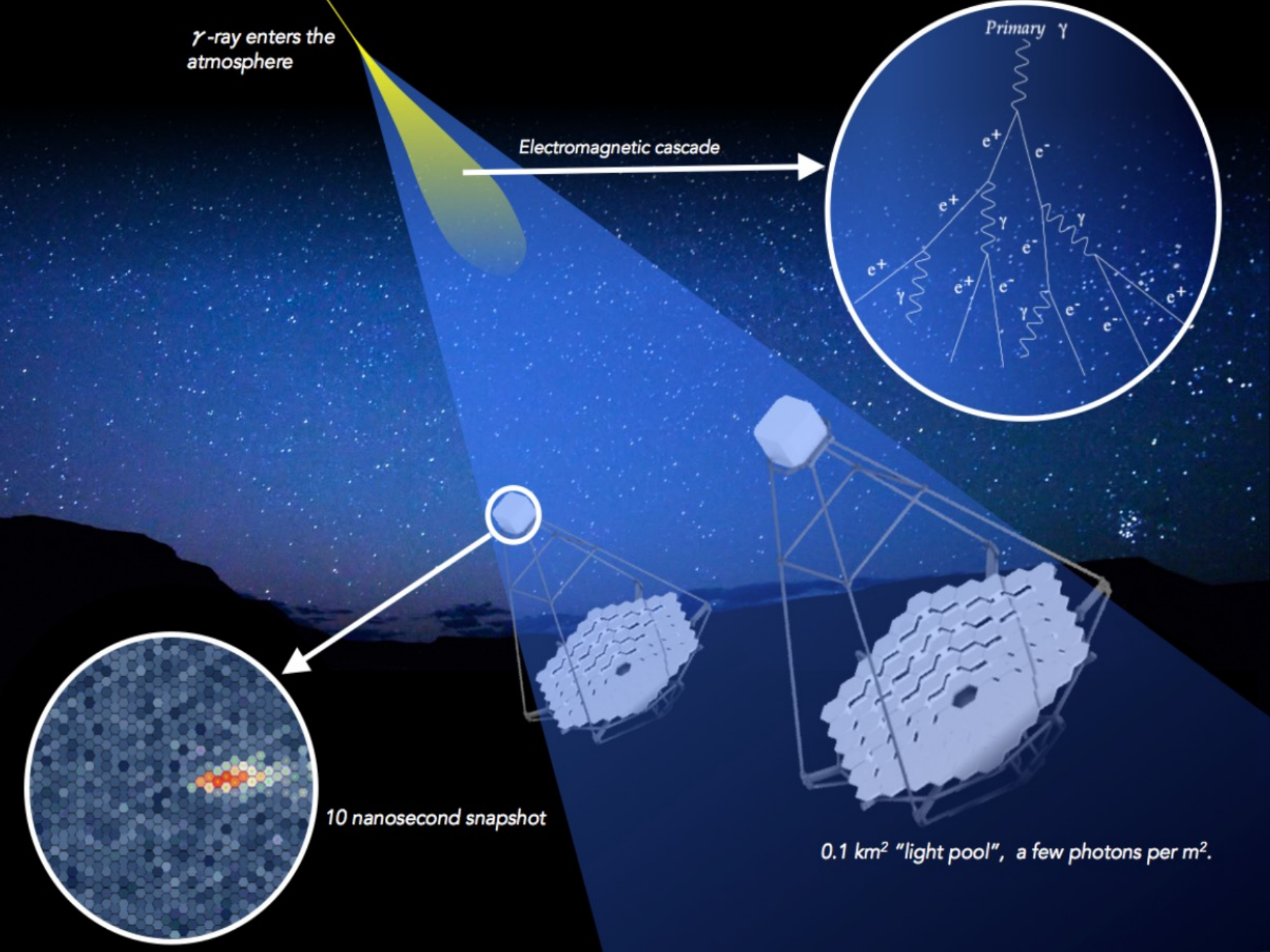
DISCUSSION POINTS

1. Synergies on collecting MWL quick look results from different facilities?

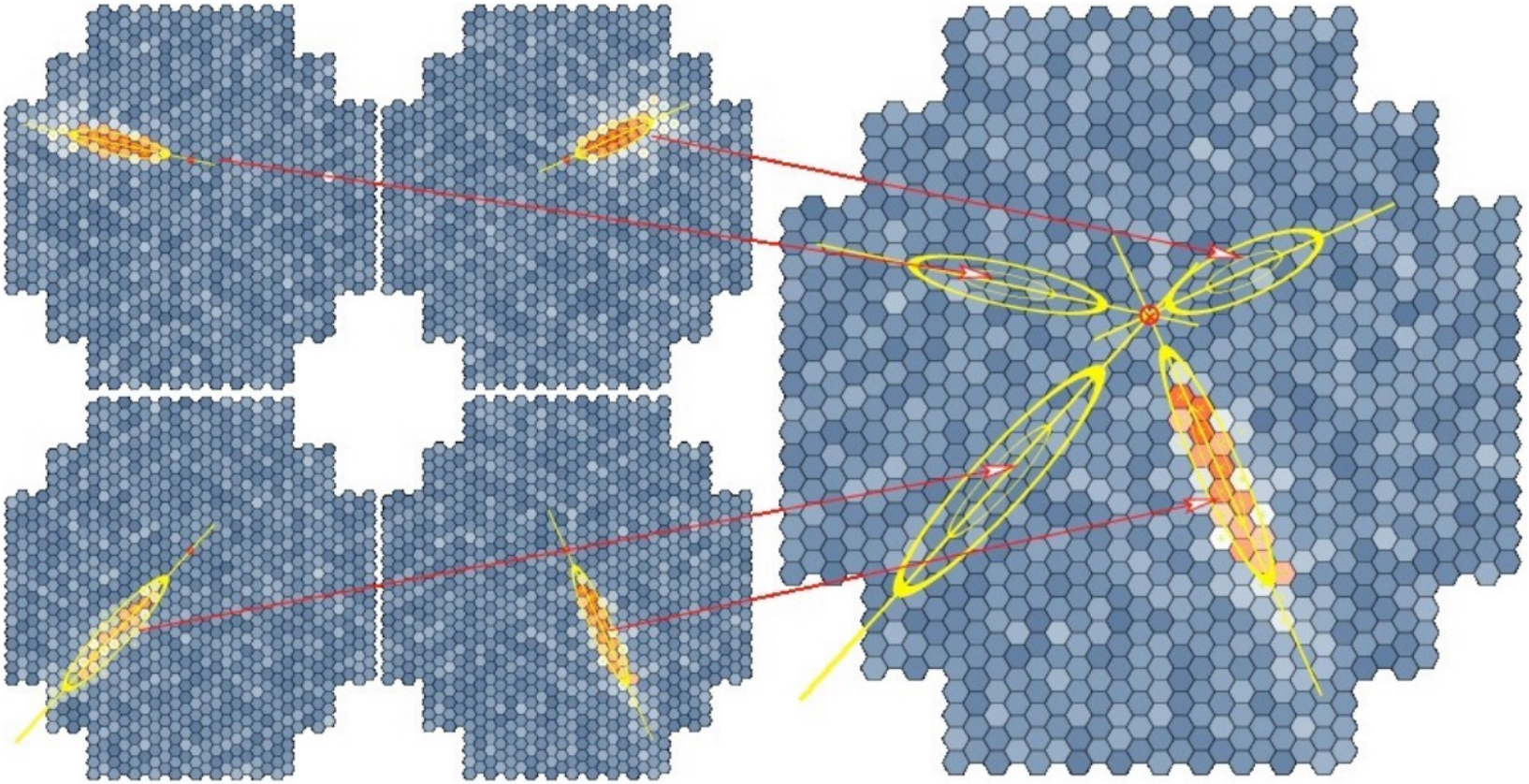
2. MWL analysis is a must! → science platforms are the way to go
   but we should guarantee the interfaces (see Carretero's talk)

3. Common support centers?

Thank you!


γ-ray enters the atmosphere
Electromagnetic cascade
Primary γ
e+
e-
γ
10 nanosecond snapshot
0.1 km² "light pool", a few photons per m².

Imaging Cherenkov technique: stereoscopy

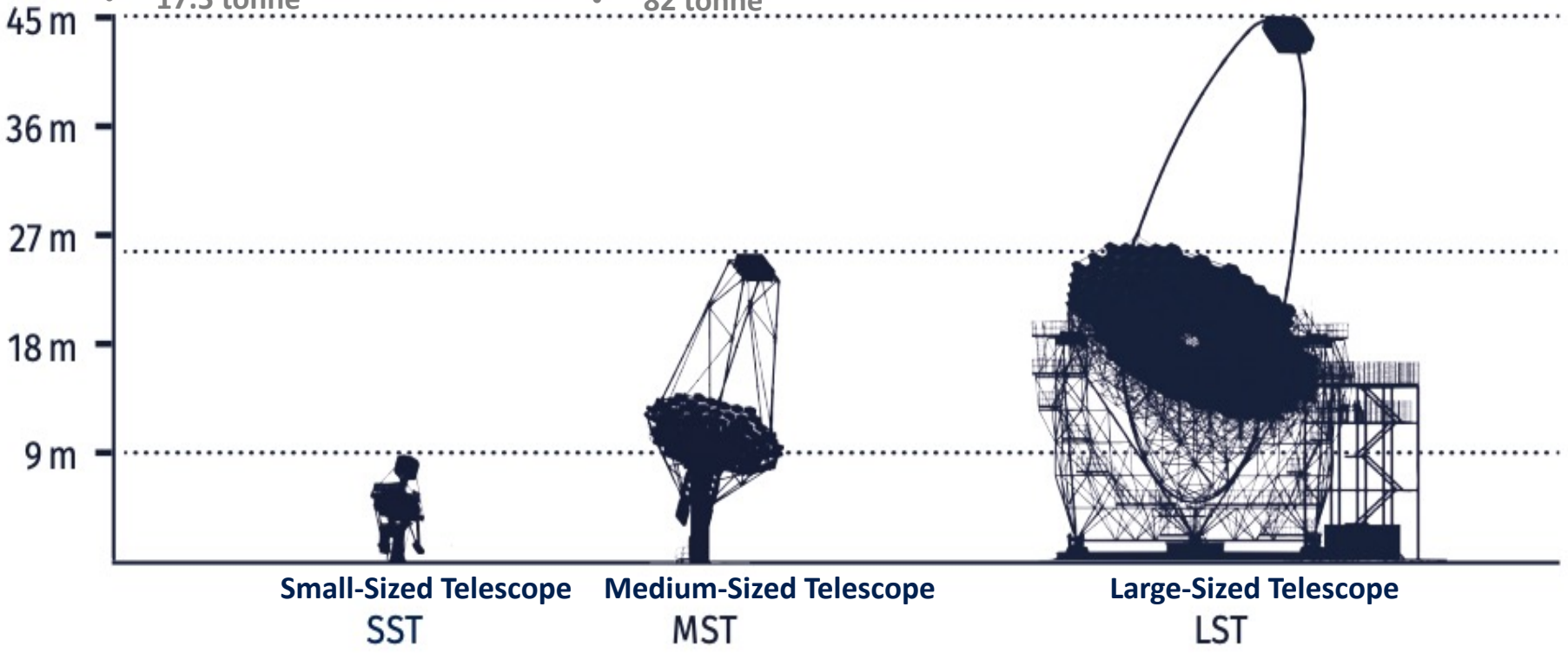


3 telescope designs

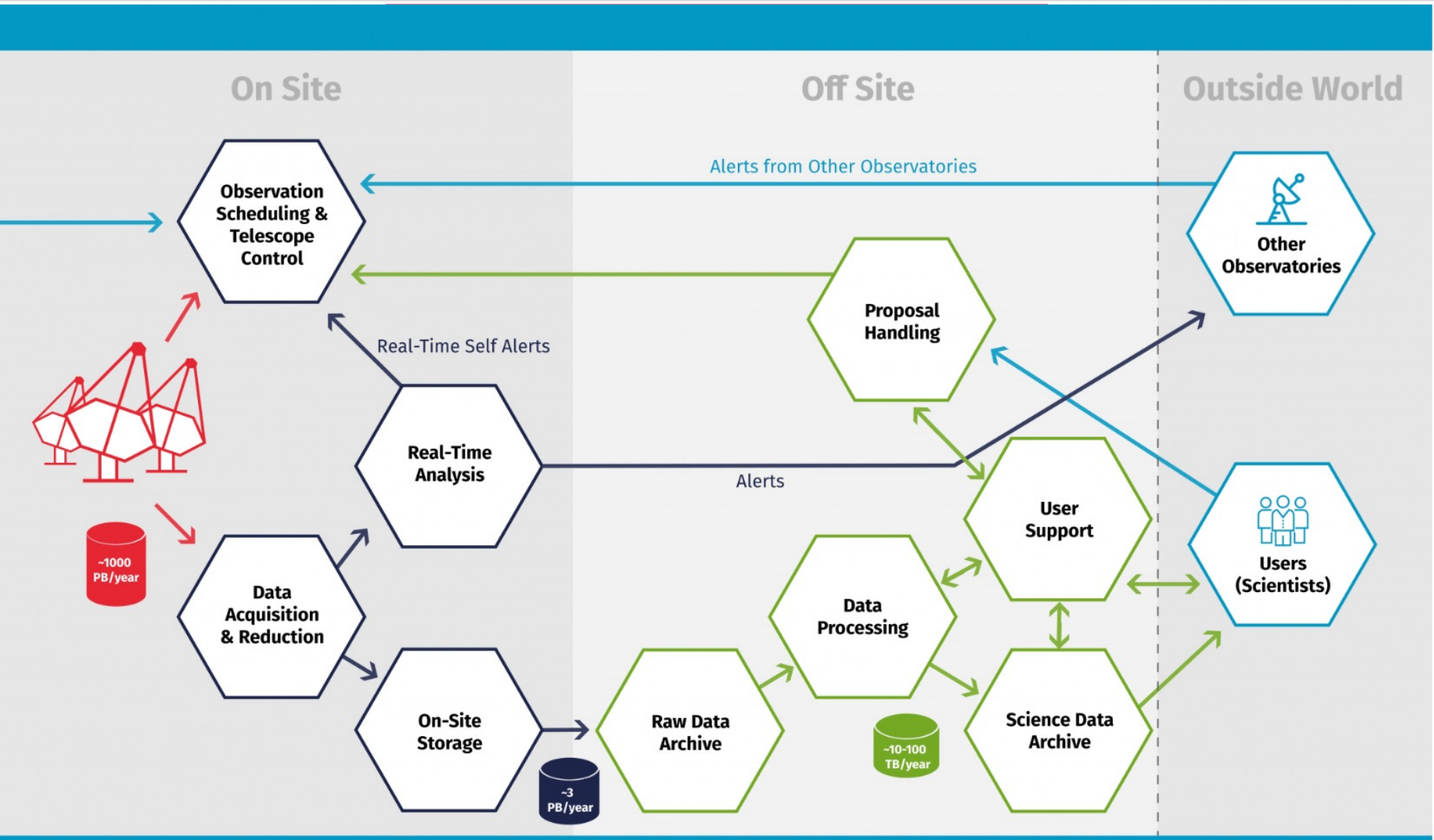
- 2-mirror Schwarzschild-Couder optical design
- 4.3 m ⌀ primary reflective surface
- SiPM camera: 2048 pixels (0.16°)
- 8.8° FoV
- 17.5 tonne

- Davies-Cotton optical design
- 12 m ⌀ reflective surface
- PMT camera – 2 designs:
  - NectarCam: 1855 pixels
  - FlashCam: 1764 pixels
- ~7° FoV
- 82 tonne

- Parabolic optical design
- 23 m ⌀ reflective surface
- PMT camera: 1855 pixels (0.1°)
- 4.3° FoV
- 100 tonne



Science operations



Data taking

SERVICE MODE

REAL-TIME ANALYSIS

- science alerts released within 1 minute

ATMOSPHERE QUALITY CARACTERIZATION & MONITORING

- Raman LiDAR
- wide FoV stellar photometer
- all-sky camera
- ceilometer
- weather Station
- anemometers
- dust counter

Science Operations