

# Public Surveys and new instrumentation for Calar Alto Observatory



# Objetives



- The workshop will help to define our scientific and technological strategy for the incoming years:
- **1 legacy program for 3.5m (to start immediately)**
- **1 new instrument (4-6 years)**



# Objetives



Very successful Call (12 proposals submitted):



6 legacy programs for 3.5m.  
4 legacies + new instrument



2 legacies + new instrument



# **Legacy programs and current instrumental developments**

# CARMENES Status



- Strategic program. To be in operation for the next decade.
- International collaboration with 13 institutions, more than 130 scientific and technical staff.
- 39 referred publications up to now
- 24 presentations in SPIE.
- 13 PhD Thesis.
- Collaboration with NASA-MIT TESS. 50 nights allocated. First alerts received.
- More than 678 nights invested since 2016 (~72 pending nights, 1 more semester).



**carmenes**

# Agreement with Beijing University



## Reverberation mapping of Super-Eddington Accreting Massive Black Holes (SEAMBH) as Cosmological Candles.



Measurement of Black Hole Mass



Coevolution of Supermassive Black Hole and Host Galaxy



High-redshift Quasars and Cosmic Reionization



Central Engine of AGN

- Approved by EC resolution in 2016 w CAFOS/2.2m telescope
- 110nights/semester (60%) until June 2022
- 600 nights allocated and 62 targets, 3223 epochs of spectra

# WORKSHOP. OBJETIVE 1



CARMENES (3.5m)  
Survey -> 2020B

SEAMBH (2.2m)  
Survey -> 2022



What to do 2020B+  
3.5m telescope?



Workshop 2020  
Objective 1

# Instrumental developments

# Current developments



- CAFÉ upgrade:
  - ERDF (FEDER funds):

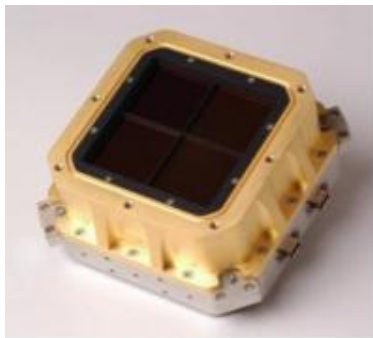


- CAHA-15-3902, ICTS-2017-07-CAHA-4, CAHA-16-CE-3978
  - Grating substitution. 14th magnitude
  - Thermal room stabilization ( $\pm 0.01\text{C}$ )
  - New Pipeline (J.L. Box)
  - RV accuracy of about 10m/s.
  - Fabry-Perot calibration unit (under progress)
  - Second phase, a vacuum chamber is foreseen. (Expected RV accuracy of about 2-5m/s).

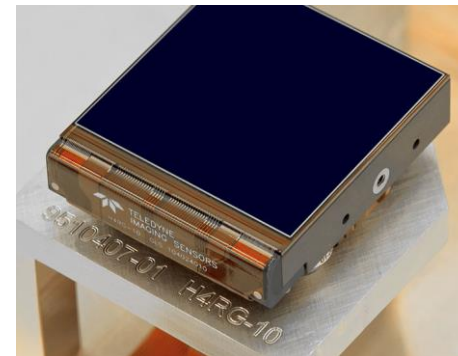
# Current developments



- PANIC Upgrade:
  - ERDF CAHA-15-3902. 1Mill. of euros.
  - Collaboration with CAHA, MPIA, IAA and AIP.



4x Hawaii-2RG,  
Total 4096x4096 pixel  
Gap of 167 pixels  
FoV 30x30 arc-minutes



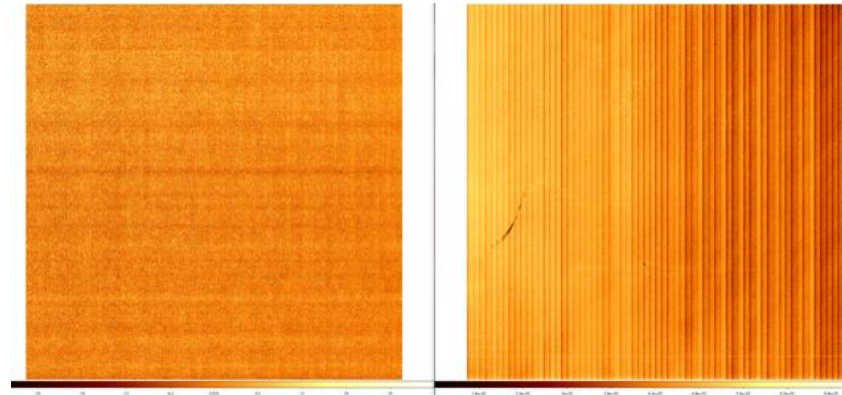
1x Hawaii-4RG-15  
Total 4096x4096 pixel  
NO gap  
FoV 27x27 arc-minutes



# Current developments



- PANIC Upgrade:
  - Already integrated into PANIC.
  - Very good detector cosmetic



- Optical tests ongoing
- Expected commissioning in June-July 2020.

# Current developments



- Upgrade of the virtualization system of the campus (CAHA-15-3902)
- Implementation of the Energetic island:
  - ICTS-2017-07-CAHA-4,CAHA-16-CE-3978
    - Acquisition of electric cars (completed).
    - Photoelectric plant of 350kW (procurement proceeding done, expected conclusion in summer 2020)
    - Biomass boiler of 750kW (public tender ongoing, expected conclusion in summer 2020)
  - Expected save of CO2 emission in 157 tons/years
  - Expected energetic optimization in 40%.
  - World-wide reference for other observatories.



# Future instrumentation for 3.5m



- RIA funded the workshop of future instrumentation and legacy projects for Calar Alto observatory celebrated in Oct-2016 at IAA-CSIC headquarters.
- May-2018, Call for letters of intent for the construction of the next generation instrument for CAHA 3.5m telescope:
  - CAHA committed 100k€ for the feasibility study (Junta de Andalucía addressed via University of Almeria).
  - 4 science cases and the corresponding instrumental ideas were received.
  - iSAC evaluated positively two cases LUCA and CARMENES update.

# Future instrumentation. LUCA



- A new instrument for studying galaxies in the local universe from Calar Alto.
- LUCA performed the feasibility study coordinated by IAA
- July 2019 the feasibility study was finalized and the final technical report sent to CAHA.

# Future instrumentation. LUCA



- After an exhaustive analysis, the Presidency-CSIC concluded:
  - Recognized the excellence of the scientific case and the efforts done for the feasibility study by the LUCA team.
  - But decided that the continuity of the project would require a deeper analysis of other competing programs, time framework, a financial strategy and the availability of the required scientific-technical team.
  - As a consequence, CSIC decided not to continue.

## Goals:

- To continue producing science of the highest impact through access to CARMENES with GTO
  - To keep the instrument competitive and at technological fore-front
- 
- **New top level requirements for CARMENES:**
    - to improve the long-term (> 24 h) stability of the RVs for the VIS and NIR
    - to stabilise the general performance of the NIR channel.



- Characterization of exoplanet atmospheres -> Move forward to study super-Earth's atmospheres.
- Continuation/extension of the CARMENES survey
  - Finalising the current survey -> Overall statistical results of exoplanet occurrences in M dwarfs
  - Deepening our understanding of exoplanetary system architectures in our solar neighbourhood -> Barnard's star, Teegarden's star, etc
  - TESS follow-up of Earth-mass planets in a few systems -> densities.

# CARMENES-PLUS: the upgrade

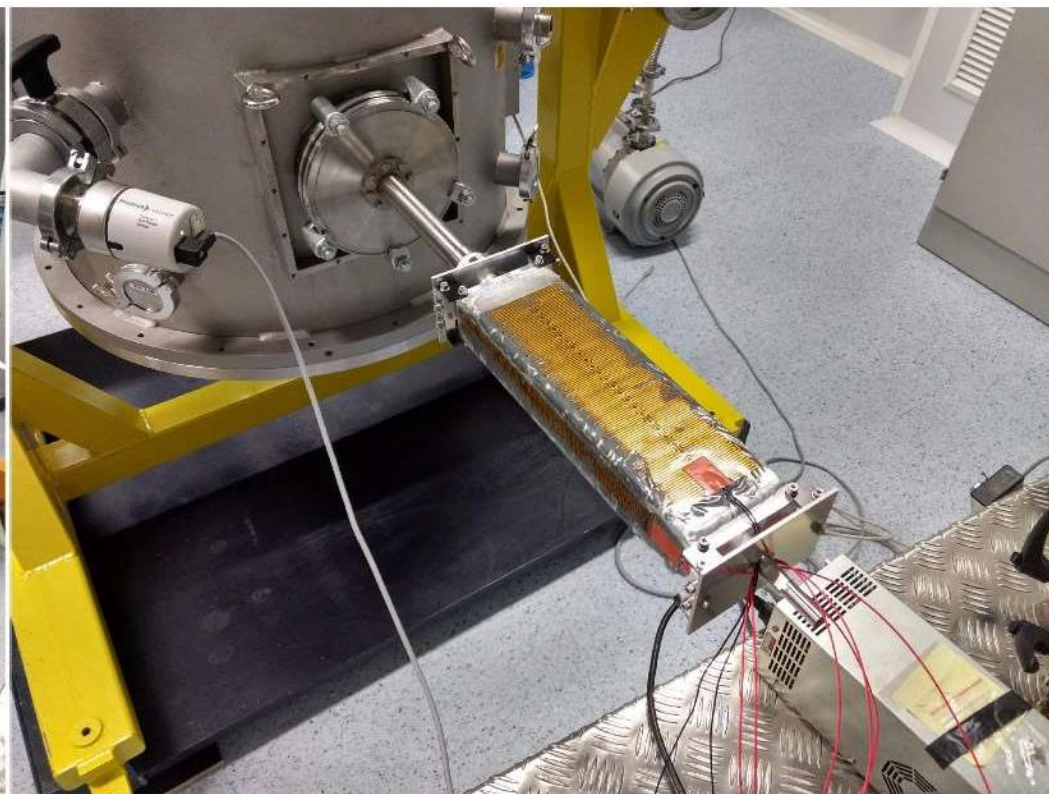


- Thermo-mechanical stabilization of CARMENES VIS and NIR
- Performance improvement of CARMENES NIR cooling system
- Operational upgrade at the observatory
- Calibration and data reduction upgrades
- **A technical report of the FS is under evaluation**

# CARMENES-PLUS: Pre-phase A activities



**MUSICA: CARMENES CS prototype**



# CARMENES-PLUS: key personnel and positions



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# CAHA strategic plan



- CAHA strategic plan:

Positively evaluated by CAIS (Comité asesor de infraestructuras singulares) for 2017-2020:

Priorities:

New instrument  
for the 3.5m/2.2m

CARMNES  
upgrade

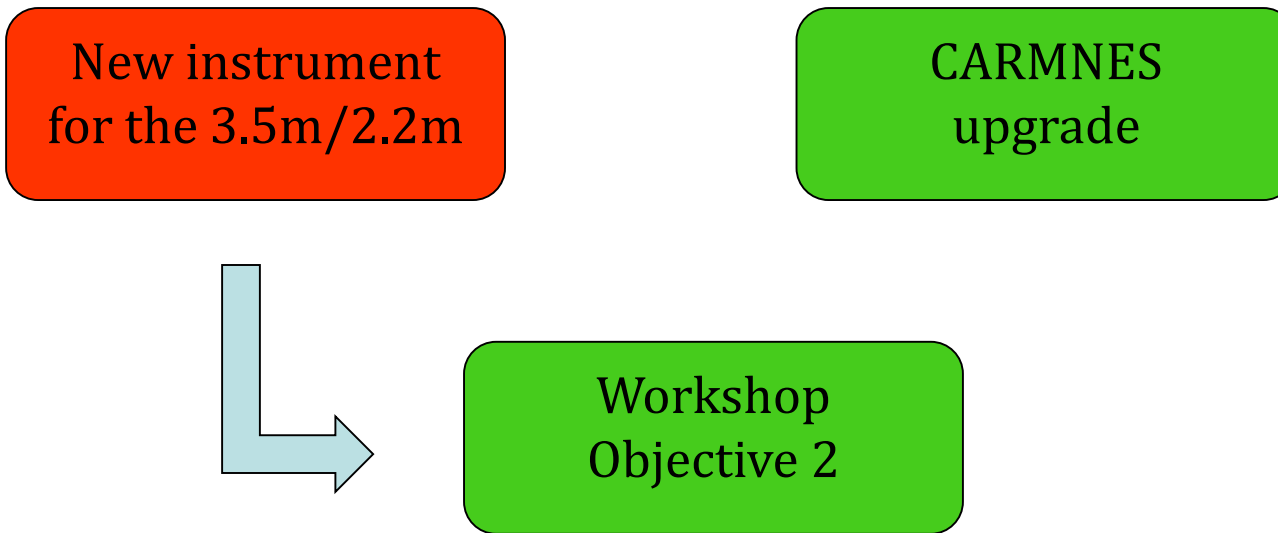
# CAHA strategic plan



- CAHA strategic plan:

Positively evaluated by CAIS (Comité asesor de infraestructuras singulares) for 2017-2020:

Priorities:



# Workshop 2020. GOALS



1. Public surveys to be carried out with instrumentation already available at the 3.5m telescope
2. Public surveys to be carried out with new instruments at the 2.2m and 3.5m telescopes.
3. Make an official call for new legacies and instrumental programs
4. CAHA SAC will evaluate the proposals and perform a recommendation to EC for execution.

# Workshop 2020. Case 1



- Minimum of 20 nights per semester for completion.
- Minimum of four semesters.
- May use others CAHA telescopes and external ones.
- Non-partners may apply but always in close collaboration with a CSIC-Junta institution. (Co-Pi role).



# Workshop 2020. Case 2



- Impossibility to be done with the current instrumentation.
- Up to two feasibility studies will be funded by CAHA. MA committed 180k€ for that purpose.
- Possibility to get ERDF to partially fund the new instrument. Must be committed **before end of 2020**. Execution before June 2023.
- Non-partners may apply but always in close collaboration with a CSIC-Junta institution. (Co-Pi role).



# Workshop 2020



- Important dates 2020:
  - March 12-13, 2020 IAA-CSIC
  - Call for standard proposals March 23- April 22.
  - CAHA SAC meeting in April 23<sup>th</sup> and Immediate EC resolution
  - 6 months for feasibility study (tentative)

# Proposals. CASE 1

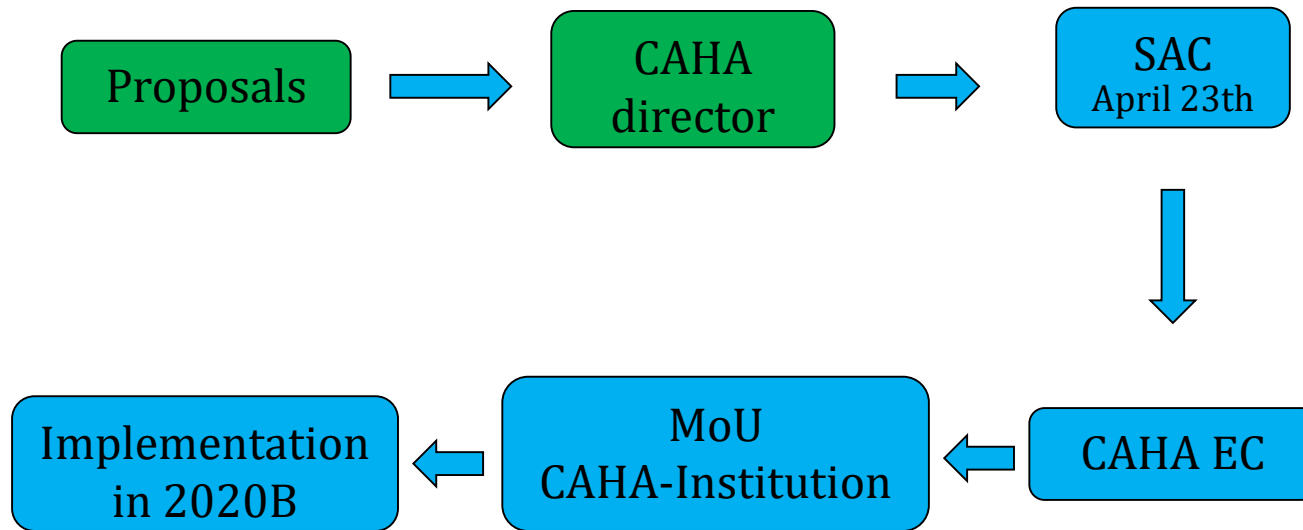


- Details of the proposal for CASE 1:
  - Scientific case. Impact and competitors.
  - State of the art and scientific rationale.
  - Participant entities, project collaborators and link to companies.
  - Justification of the requested observing time.

# Workshop 2020



## CASE 1. Procedures

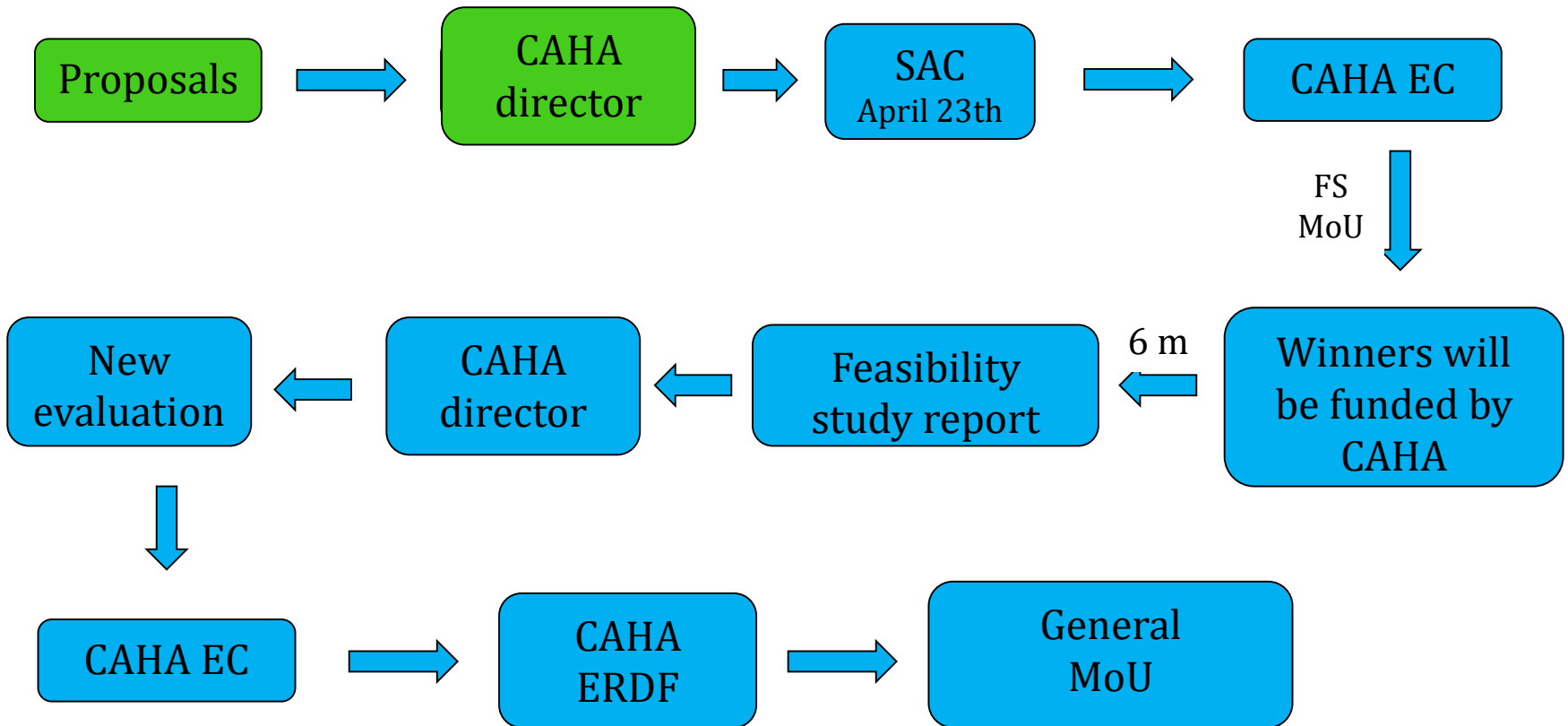


# Proposals. CASE 2



- Details of the proposal for CASE 2:
  - State of the art and scientific rationale.
  - Justification of the requested observing time.
  - Technical description and capabilities of the instrument.
  - Description of the consortium (institutions, people).

## CASE 2: Procedures



# Protocol for new instruments. Approved feasibility studies



- **Section 1. Detailed report of the new instrument:**
  - Scientific purpose, competitiveness analysis of the main scientific case of the instrument within the proposed period. Main aim and methodology.
  - Description of the scientific requirements, resolution, spectral range, sensibility, sampling.
  - Description of the technical requirements. Mechanical and optical description, detectors, Front-end properties. Compatibility with the current CAHA instrumentation. Calibrations, electronic control.
  - Justification of the requested observing time. Description of the observing plan.

# Protocol for new instruments. Approved feasibility studies



- **Section 1. Detailed report of the new instrument:**
  - Proposed location of the instrument at CAHA. Description of the interfaces.
  - General control of the instrument. Electronics and software control specification. Pipeline description, exposure time calculators. Compatibility with the current script commands of the telescope.
  - Computer facilities, servers, storage systems, data transmission.
  - Time allocation of the observations. Compatibility with other current scientific programs.

# Protocol for new instruments. Approved feasibility studies



- **Section 2. Description of the consortium:**
  - Describe the consortium proposal, national and international members whose are legally authorized.
  - Capacity of the signatory to make legal commitments for each member.
  - Distribution of tasks and responsibilities. Planned work packages.
  - Project structure (management)
  - Previous expertise of the consortium team in astronomical instrumentation development.
  - Expected timetable and milestones (CDR, PDR, FDR phase AIV, commissioning).
  - Web page.

# Protocol for new instruments.

## Feasibility studies



- **Section 3. Detailed financial report:**
  - Global budget and justification.
  - Capacity of the consortium to self-financing.
  - Proposed strategy:
    - Distribution of the budget.
    - Expected contributions of the members.
    - Expected contribution from CAHA.
    - Estimation of the human resources needed
    - Gantt diagram fully justified
  - General risk analysis

# Contact info



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Thanks for your attention!!!