THE CALAR ALTO SCHMIDT-LEMAITRE TELESCOPE:

AN INNOVATE CONCEPT FOR WIDE FIELD ASTRONOMY

Simona Lombardo & the CASTLE team

Laboratoire d'Astrophysique de Marseille

I present here the Calar Alto Schmidt-Lemaitre Telescope (CASTLE) concept, a technology demonstrator for curved detectors, that will be installed at the Calar Alto Observatory (Spain). This telescope has a wide field of view (2.36x1.56 deg^2) and a design, optimized to generate a Point Spread Function with very low-level wings and reduced ghost features, which makes it considerably less susceptible to several systematic effects usually affecting similar systems. These characteristics are particularly suited to study the low surface brightness Universe. CASTLE will be able to reach surface brightness orders of magnitude fainter than the sky background level and observe the extremely extended and faint features around galaxies such as tidal features, stellar halos, intra-cluster light, etc. CASTLE will also be used to search and detect astrophysical transients such as gamma ray bursts (GRB), gravitational wave optical counterparts, neutrino counterparts, etc. This will increase the number of precisely localized GRBs from 20% to 60% (in the case of Fermi/GMB GRBs).

simona.lombardo@lam.fr

Meeting of Sociedad Española de Astronomía

CONTEXT: LOW SURFACE BRIGHTNESS UNIVERSE

Image credit: CFHT/Coelum

INFORMATION ON GALAXY FORMATION AND EVOLUTION

GOALS:

- Avoiding internal reflections & contamination of bright stars

- Test curved detectors for astronomy

WHITE PAPER:

https://arxiv.org/pdf/2006.13956.pdf

LAM
LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE

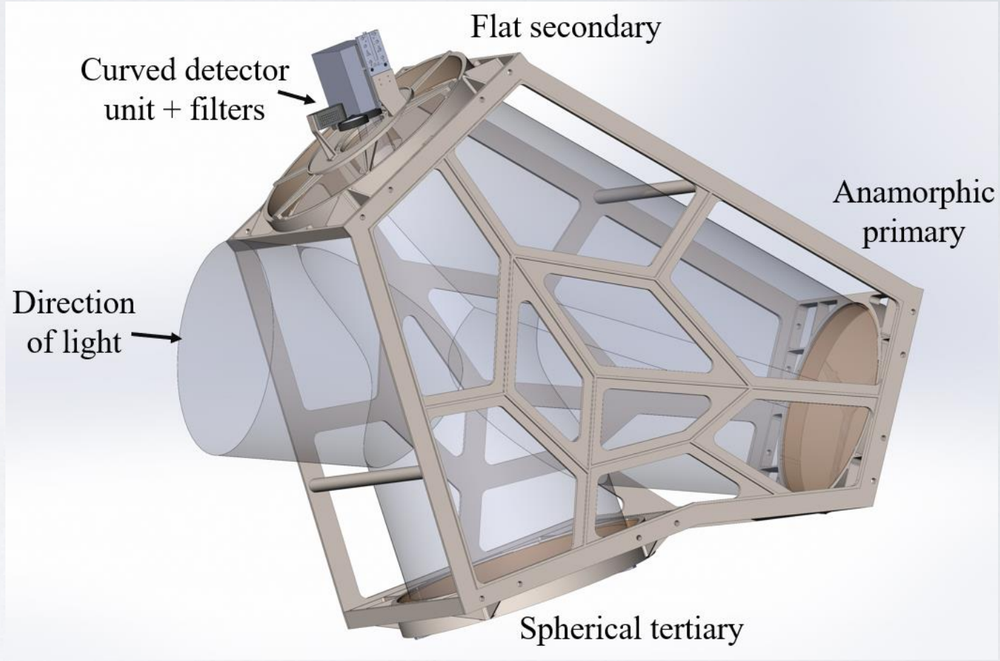
METHODOLOGY & PROJECT

Instrument & project scientist of Calar Alto Schmidt-Lemaitre Telescope (CASTLE)

METHOD:

CASTLE innovative telescope

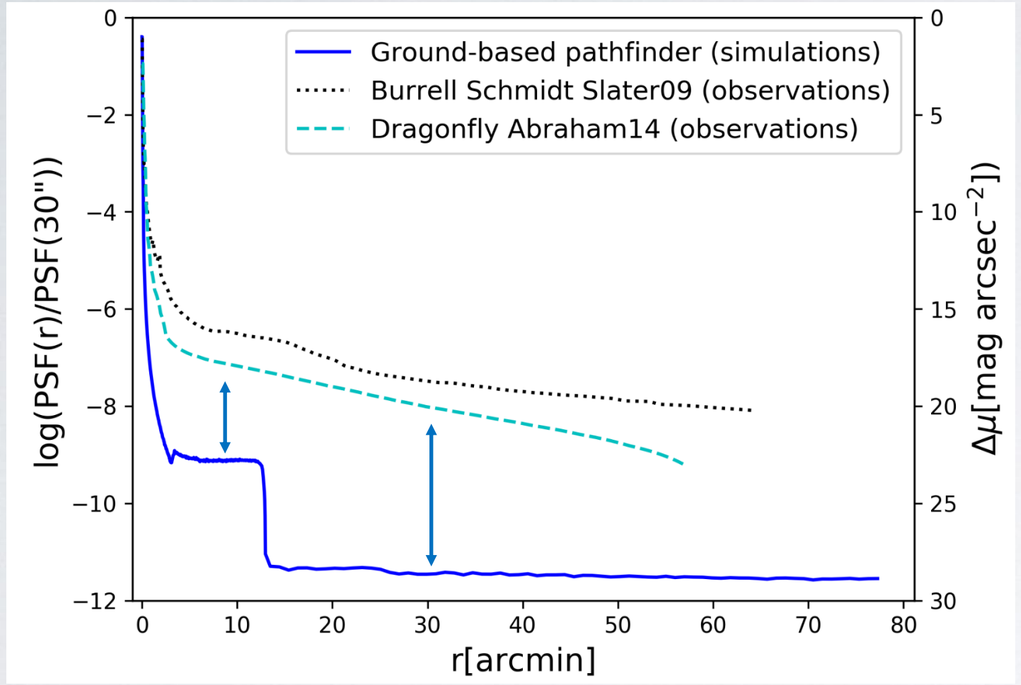
- FoV: 2.36 °x1.56°
- Primary diameter: 36 cm
- No spider & no lenses + **curved detector**



Lombardo + 19, MNRAS
Lombardo + 18, SPIE
Muslimov + 17, Appl. Opt.

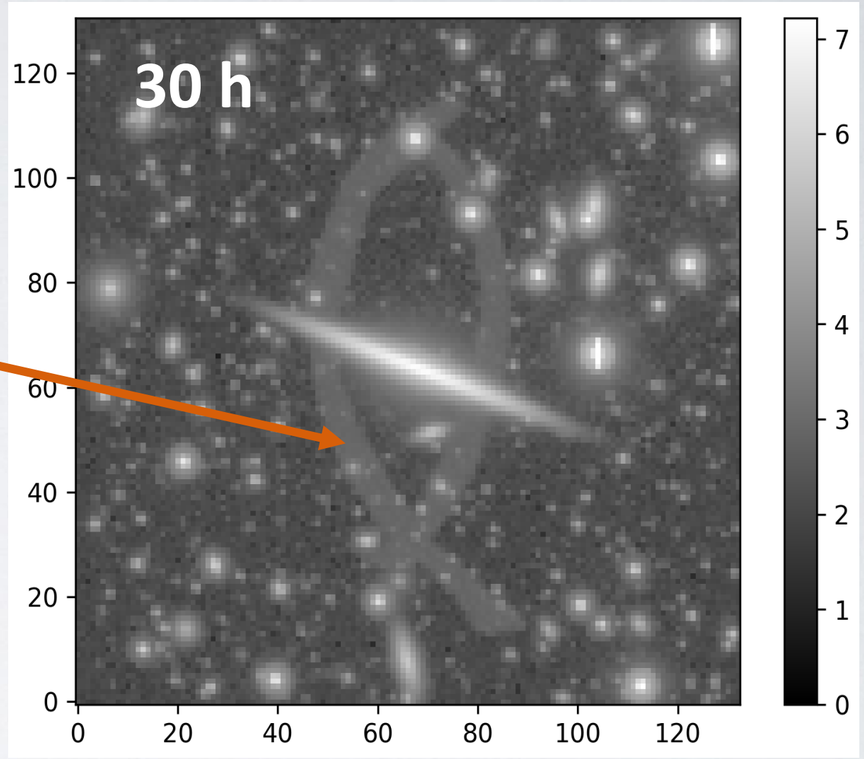
RESULTS: END2END PHOTON MONTE CARLO SIMULATIONS

GOAL: avoiding internal reflections & contamination of bright stars



Lombardo et al., MNRAS, 2019

Loop:
29 mag/arcsec^2



GREAT IMPROVEMENT IN PERFORMANCES!!

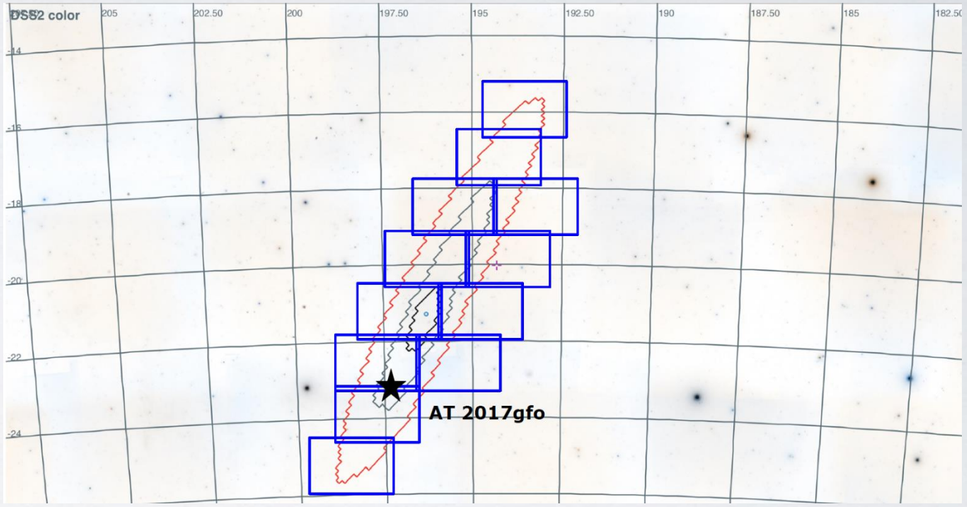
Lombardo + 19, MNRAS
Lombardo + 18, SPIE
Muslimov + 17, Appl. Opt.

LAM
LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE

RESULTS: TRANSIENTS SEARCH & DETECTION

- **Large field of view** 2.36 °x1.56°
- **Pixel size ~1”** on sky
- **Robotic** telescope

Lombardo et al., arxiv:2006.13956v1 , (2020)



AT 2017gfo observed by CASTLE

Ideal for transient search and detection!
(GW EM counterpart, neutrino counterpart, GRBs, etc.)

LAM
LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE

IMPACT & FUTURE PROSPECTS

CASTLE WILL BE THE FIRST TELESCOPE WITH CURVED CMOS SENSOR

- Telescope **integration** and lab tests by **fall 2020/2021**
- Commissioning on-site and **first light 2021/2022**
- Implementation of automatic observing mode and **robotic facility fall 2022**

WHITE PAPER:

https://arxiv.org/pdf/2006.13956.pdf

LAM
LABORATOIRE D'ASTROPHYSIQUE DE MARSEILLE