

Mid-IR counterpart of radio-loud AGN-hosting-BCG

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Overview of quick presentation

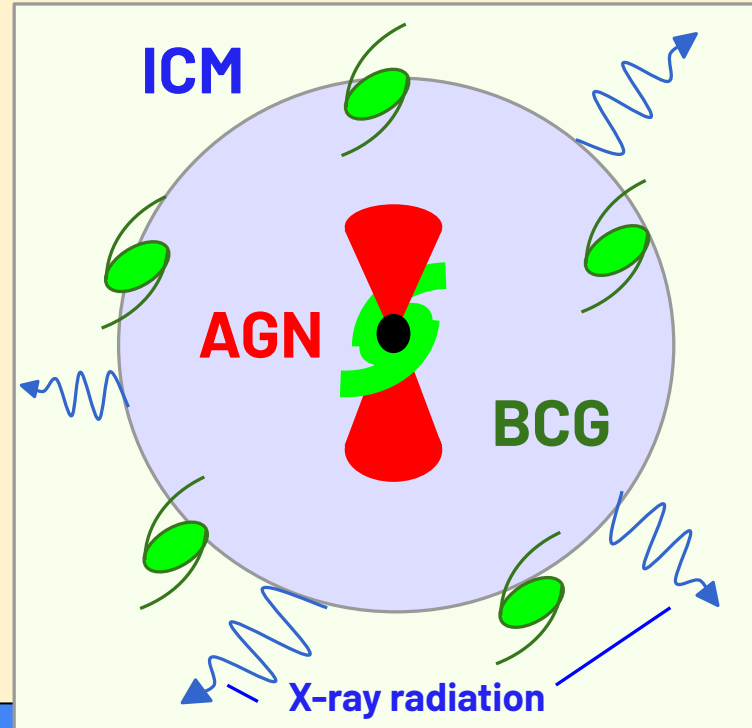
- **Background**
 - A brief explanation on my project
- **Motivation from JWST**
 - A scientific goal to JWST data with my project
- **What (had) I done.**
 - Results

Background: a brief review

Brightest cluster galaxy (BCG)
is:

- A central member of galaxy cluster
- Unlike typical galaxies, a BCG is inside **intracluster medium (ICM)**.
- An hot gas ICM can interact with BCG in various ways, including an active galactic nuclei (**AGN**)

(“**AGN-hosting-BCG**”)

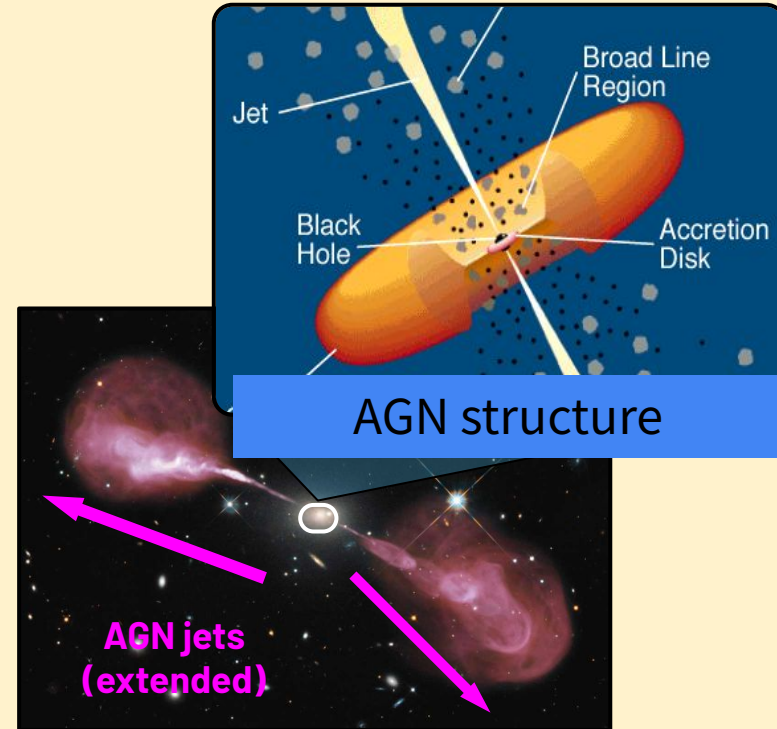


Simplified diagram for AGN-hosting-BCG

Background: a brief review(2)

Radio-loud active galactic nuclei (AGN) is:

- A supermassive blackhole at centre of BCG that become “active” / shooting out relativistic jet
- Synchrotron radiation makes the jet radio-brighted (“loud”).



Kinematic mode/
Radio-loud- AGN

AGN-hosting-BCG study

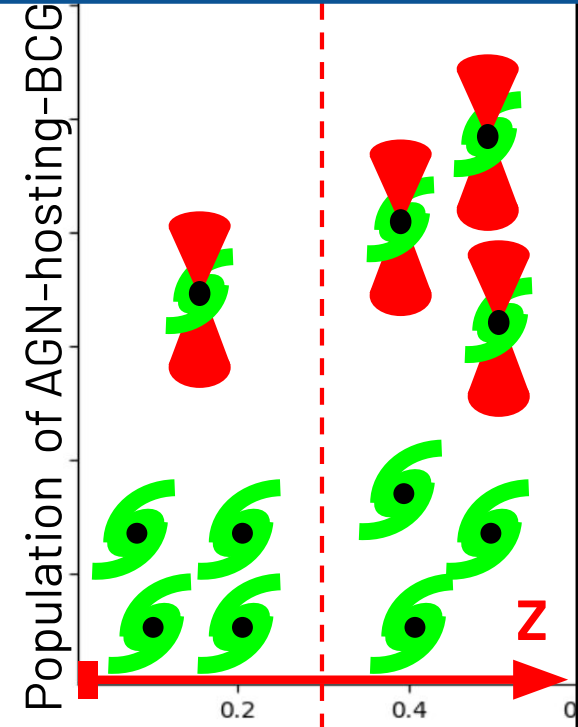
The study begin with a question:

“How does the population of radio-loud AGN-hosting-BCG evolve with time”

To achieve this:

- We use BCG catalog¹ (ra, dec, redshift²) to find radio brighted source in 1.3675 GHz mid-RACS³ (radio wavelength survey)

cite : ¹Bleem et al. (2015), ²Bocquet et al. (2019),
³Duchesne et al. (2023)



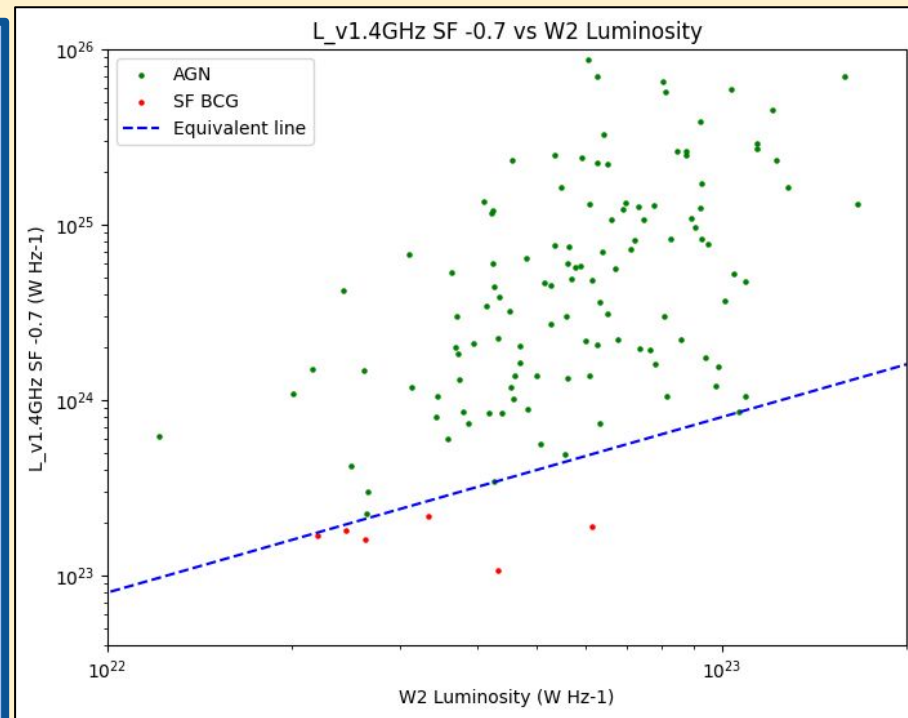
AGN-hosting-BCG diagram

AGN-hosting-BCG study result

- To distinguish between star forming galaxy and radio-loud AGN >>
 - We use WISE band 2 luminosity¹ as a part of finding AGN.

>> We now know which one is AGN or star-forming BCG.

>> **Have a quick look in NIRCam!**



AGN-hosting-BCG diagram

Motivation from JWST

Target name:

- SPT-CL0404-4418

Redshift:

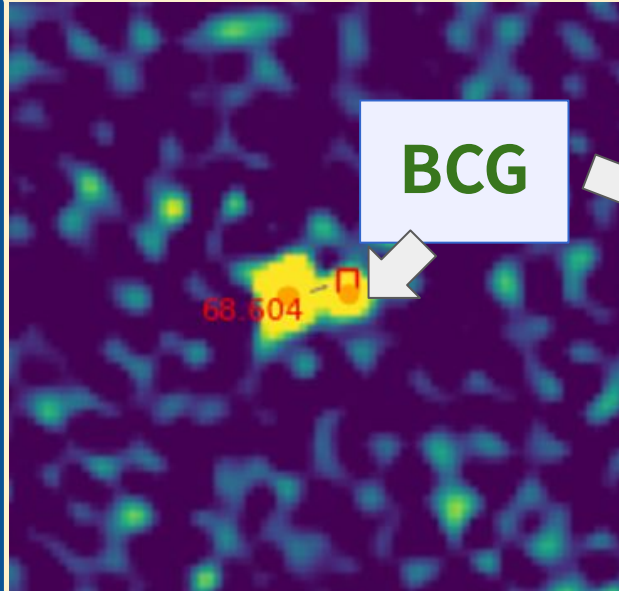
- 0.8

Data from proposal:

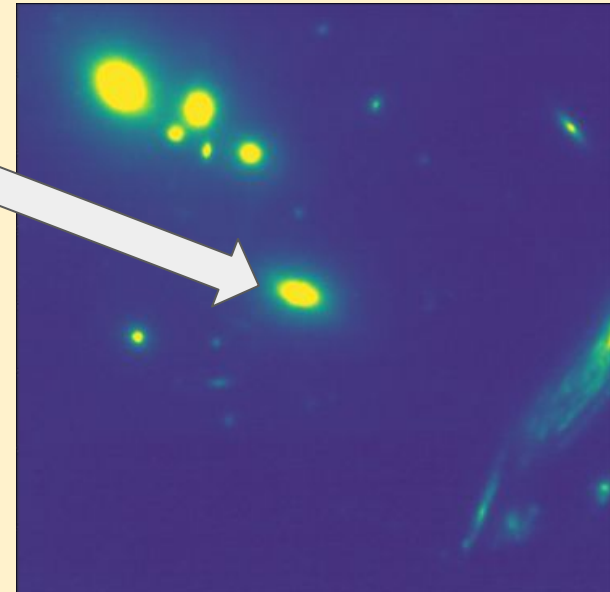
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Science goal:

- **Find basic properties of this BCG!**

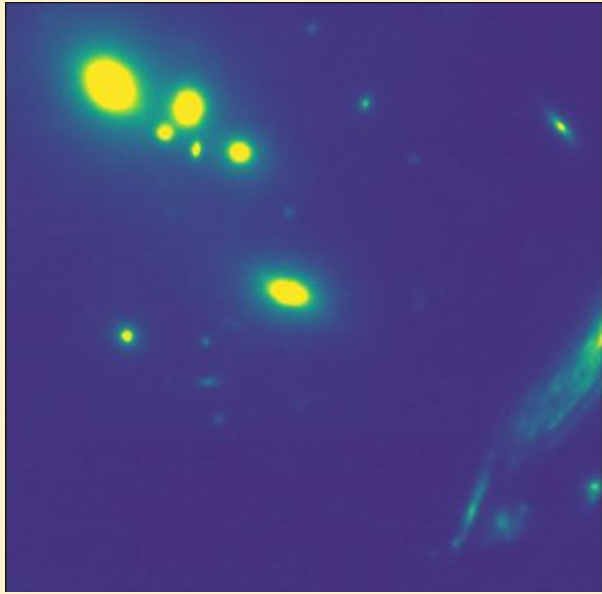


RACS-mid (1.4 GHz radio)

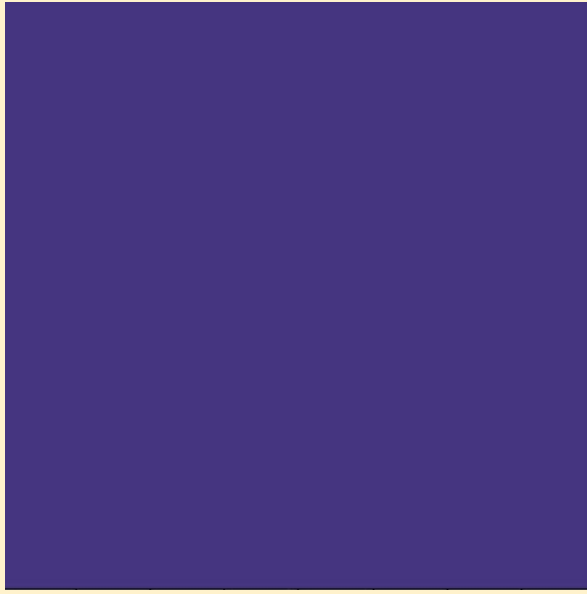


NIRCam Fw150W2
(long wavelength IR)

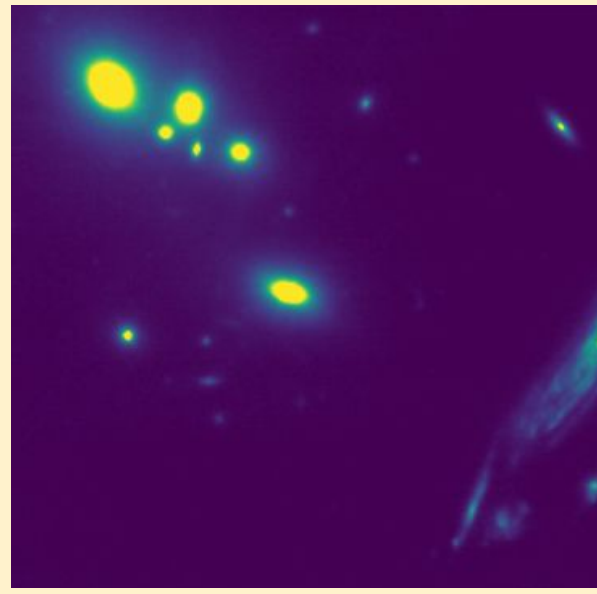
What (had) I done: result



Stage 3 (sci product)



Background



Background-subtraction

- Package use: photutils -> Background2D, MedianBackground

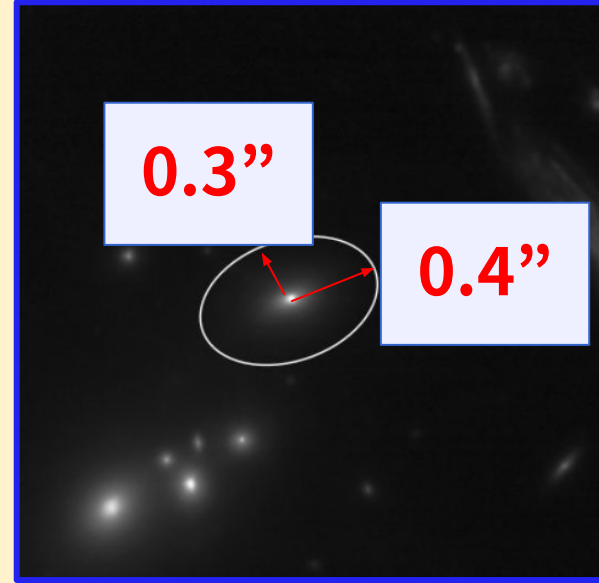
What (had) I done: result (2)

BCG parameters:

- Semimajor = 0.412 arcsec
- Semiminor = 0.273 arcsec
- Eccentricity = 0.75



Segmentation



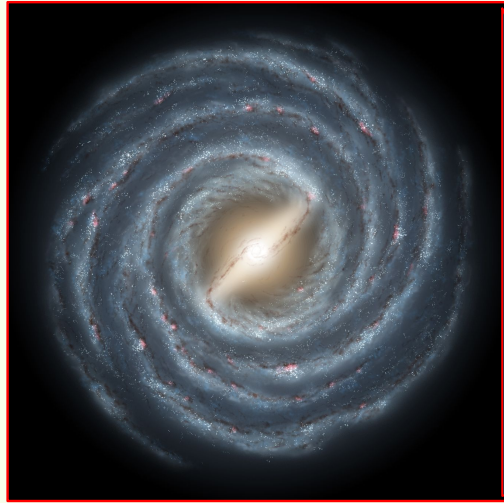
Kron radius

- Package use: photutils -> source finding

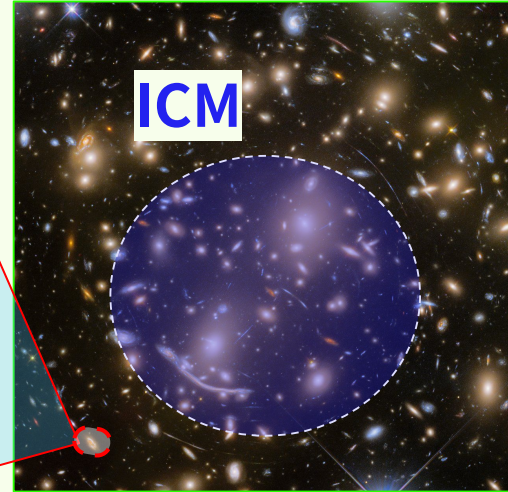
End of presentation

Thank you

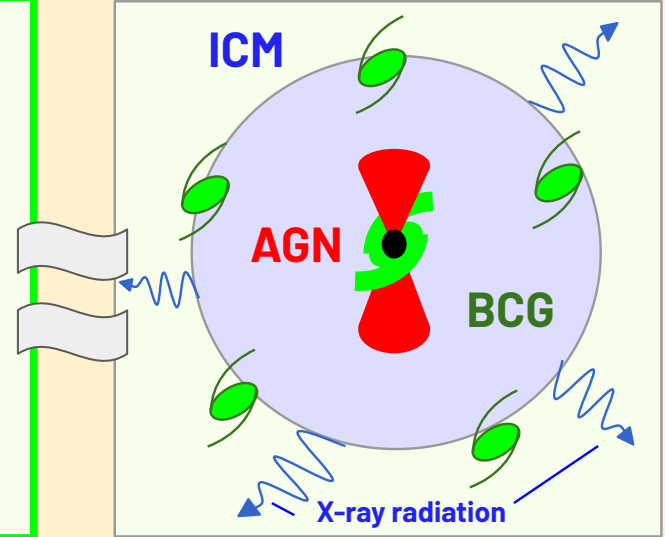
Background: a brief review



A galaxy (Milky way)



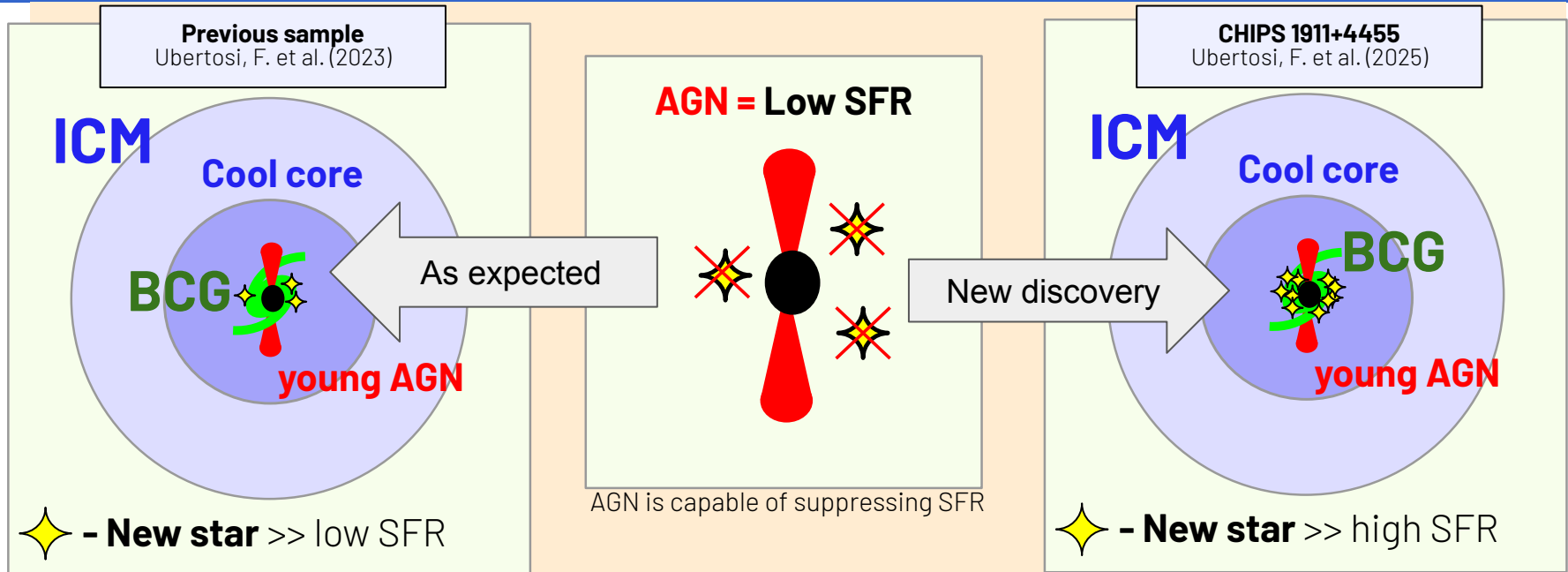
A galaxy cluster (Abell 370)



A galaxy cluster (simplify)

Definition of a galaxy cluster: 2 or more galaxies bound together

Summary: The cooling timescale of the cool core system

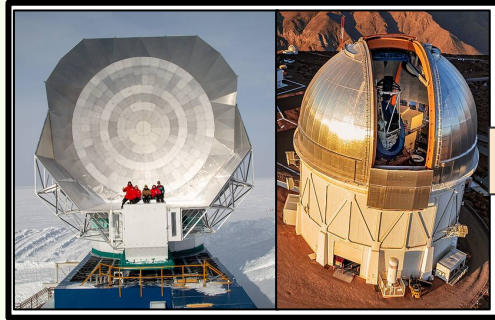


A illustration represent of his boundary cool core system

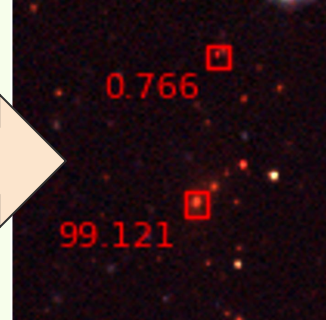
A illustration represent CHIPS 1911+4455 cool core system

- But this system has a high SFR → A new type of boundary cool core system.
- Additional informations: Queuing of hot gas and star-forming gas have a different timescale?

Our project's procedure

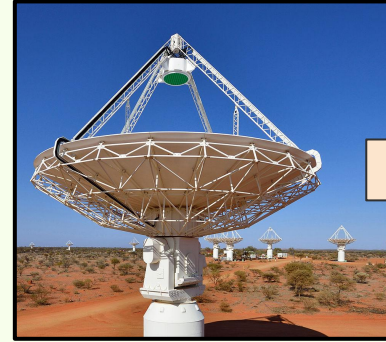
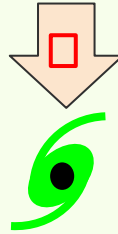


South pole telescope (left)
and Blanco 4m telescope (right)

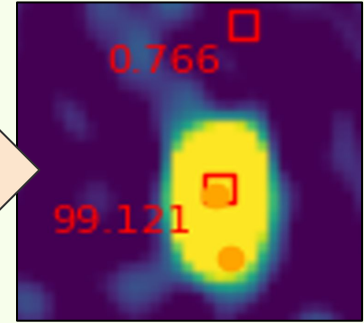


BCG positions from DeCALs
(Optical bands)

BCG data (position)



ASKAP radio
telescope



Radio luminosity data from
ASKAP(1.4GHz)

Radio-loud AGN candidates (flux)



- We use the South Pole Telescope with Sunyaev-Zeldovich effect (SPT-SZ) to provide the BCGs position data.
- ASKAP telescope data for finding the radio-loud AGN candidates