SKA era x VLBI:
Into the Center of Southern-Sky High-Redshift Quasars

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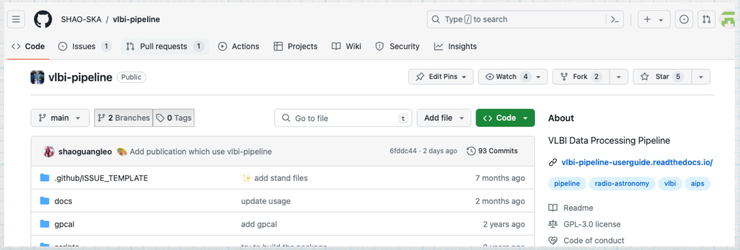
Scientific Background

- With the continuous improvement of multi-band sky survey capabilities in optical, infrared, and radio wavelengths, high-redshift active galactic nuclei (AGN) have been discovered, providing valuable samples for studying the early activity of supermassive black holes and cosmic evolution.

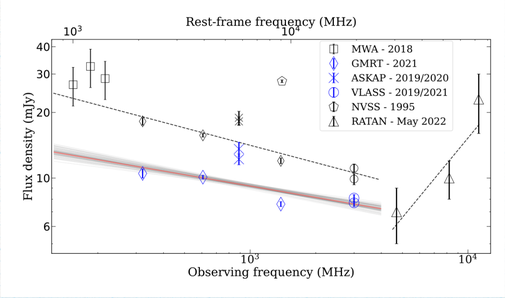
Method

- We obtained very long baseline interferometry (VLBI) observations to image the targets with the resolution around 5-10 milli-arcsecond (mas). By combining observations from other radio arrays, we will comprehensively analyze the radio emission morphology, structure, origin, variability, and polarization properties of high-redshift AGN, allowing us to infer the dynamical features and driving mechanisms of early cosmic jets.
- Specailly, our group developed the new VLBI data processing pipeline, greatly reducing the time usage and difficulty for VLBI users. If you are interested in, please find the pipeline in Github: https://github.com/SHAO-SKA/vlbi-pipeline

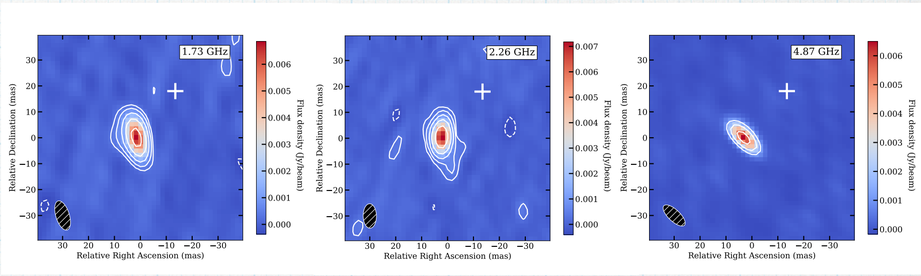


Case study 1 · SRGE J170245.3+130104

- Identification: discovered by eROSITA, radio detections from ASKAP, MWA, GMRT, VLA ...
- VLBA observations: flat spectrum, high brightness temperature ➡️ blazar



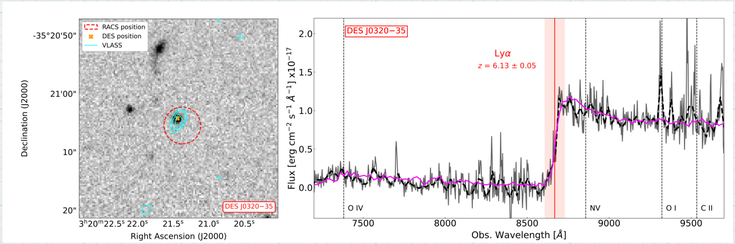
An et al. 2023



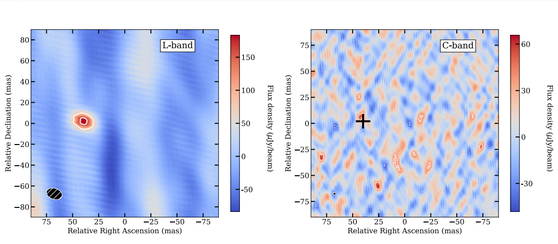
Liu et al. 2024; VLBA observations

Case study 2 · DES J0322−18

- Identification: combination of the radio Rapid ASKAP Continuum Survey (RACS; at 888 MHz) and the optical/near-infrared Dark Energy Survey (DES).
- EVN+eMERLIN observations: Detection in L-band, non detection in C-band ➡️ steep spectrum



Ighina et al. 2023



EVN observations