# Multifrequency analysis of a post-merger X-shaped radio galaxy

Arpita Misra





Marek Jamrozy, Marek Weżgowiec Astronomical Observatory of Jagiellonian University

Contact : amisra@oa.uj.edu.pl

LOFAR Family Meeting, Olsztyn, June 2023



#### **Optical observations of CGCG 292-057**





# Radio Morphology





LOFAR Family Meeting, June 2023

## **Radio Morphology**



30



LOFAR DR2 - High resolution map (6") +low resolution contours (20")



#### LOFAR Family Meeting, June 2023

#### **Spectral Index Analysis**



- Particle lose energy via synchrotron and inverse-compton losses.
- Spectral index provides information about activity of the source.
- The primary lobes and the core show flatter spectra than the wings.
- The gradient in the SI in the north western wing can hint at the direction of plasma flow (clockwise).
- The wings are separated into 4 regions W1, W2,W3,W4 based on same/similar SI value to perform ageing analysis.



SI map between LOFAR 144 MHz and VLA 5 GHz

### **Particle Injection Models**

- Primary lobes and wings were fitted with **Jaffe Perola(JP)** and **continuous injection (CI)** models for calculating radiative losses.
- Models use initial power law distribution to compute time evolution of the energy losses in particles.
- Best fit for **primary lobes** was **CI model** and for the regions of the **wings** was **JP model**.



#### **Radio Core and Inner lobes**



FFA model for core

Attenuation of radiation  $\longrightarrow$  External homogeneous ionized screen around synchrotron emitting plasma



Radio spectra of the core with the double homogeneous FFA model

#### **Radio Core and Inner lobes**



LOFAR Family Meeting, June 2023

Radio analysis of CGCG292-057



#### X shaped morphology : Jet Precession ??





• Post-merger system

# X shaped morphology : Jet Precession ??





• Post-merger system

• Wiggles in jet

#### Summary



We conducted multifrequency observations using GMRT and VLA in the range of 150 MHz - 5 GHz.

We fit particle injection models and performed ageing analysis using the radio spectra.

### Summary



We conducted multifrequency observations using GMRT and VLA in the range of 150 MHz - 5 GHz.

We fit particle injection models and performed ageing analysis using the radio spectra.

The X- shaped morphology could be the result of jet reorientation following orbital motion of a binary SMBH pair, causing jet precession lasting a few million years.

CGCG 292-057 is an exceptional source as it shows multiple stages of galaxy evolution at once:

- Evidence of a past merger
- X-shaped morphology
- AGN rebirth