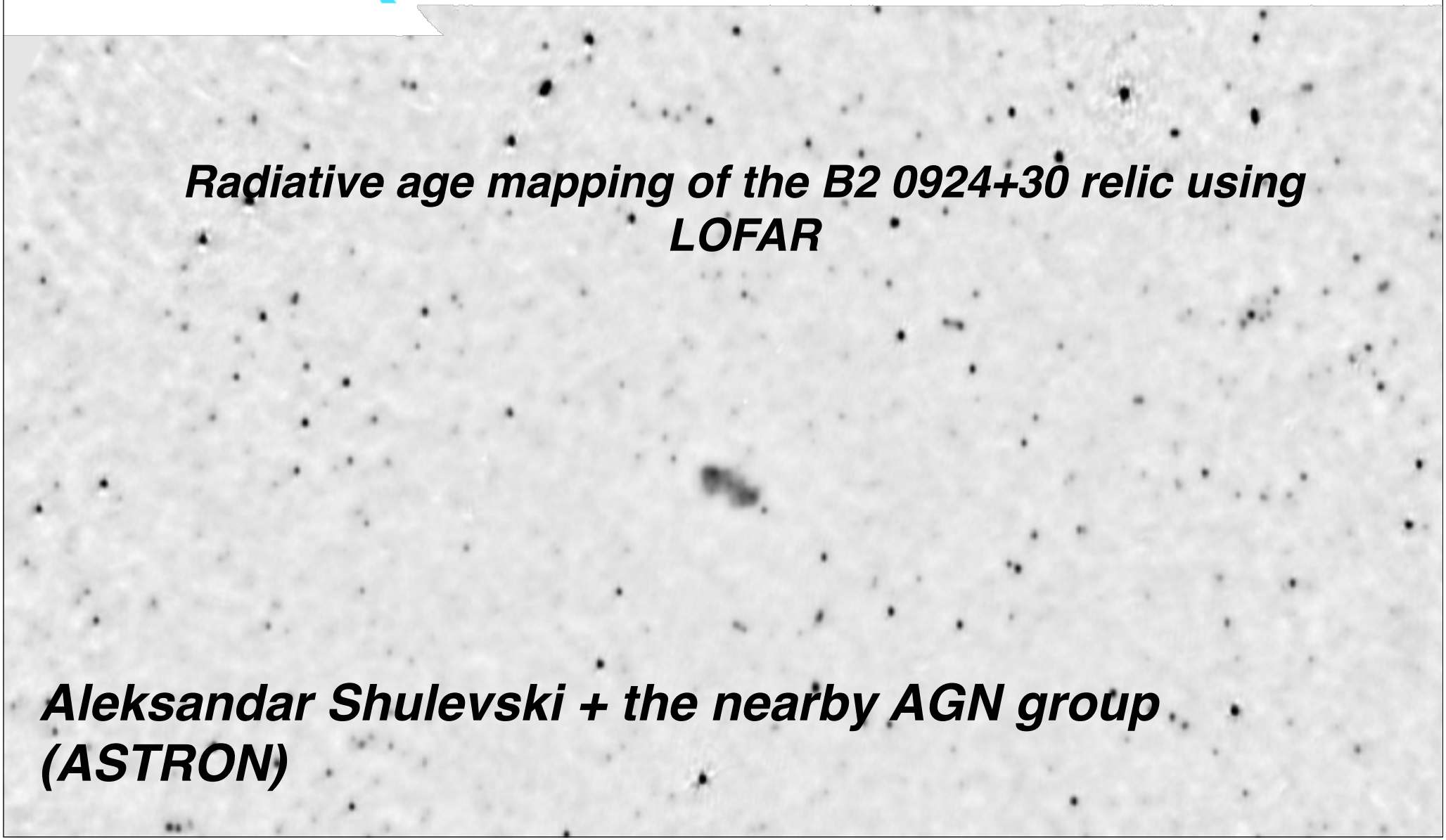
ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

Radiative age mapping of the B2 0924+30 relic using LOFAR



Aleksandar Shulevski + the nearby AGN group (ASTRON)

ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

OUTLINE:

- AGN radio relics
- A LOFAR look at the B2 0924+30 relic
  spectral and ageing analysis
- Results and prospects

ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

AGN radio relics:

- Only observable tracer of *past* AGN activity

- Very few relics observed so far
  that is about to change…

  LOFAR - high spatial resolution below 200 MHz
  Good at imaging low surface brightness objects

ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

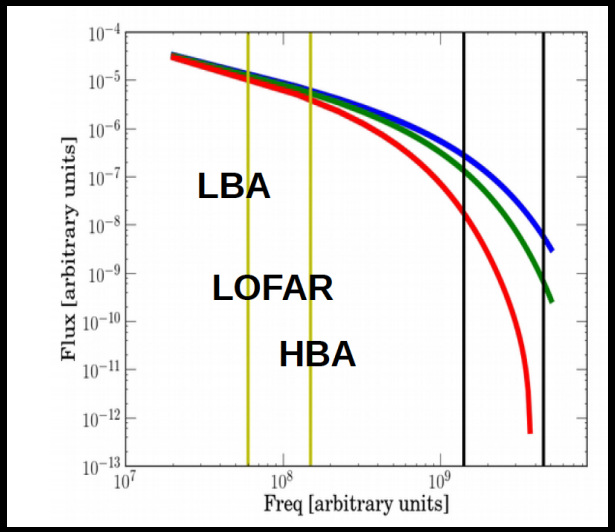
AGN radio relics:

Morphology: no jets, weak or no radio core (FR II case)

Way to ascertain the AGN duty cycle (Ton / Toff)

radiative energy losses -
steep high frequency spectra

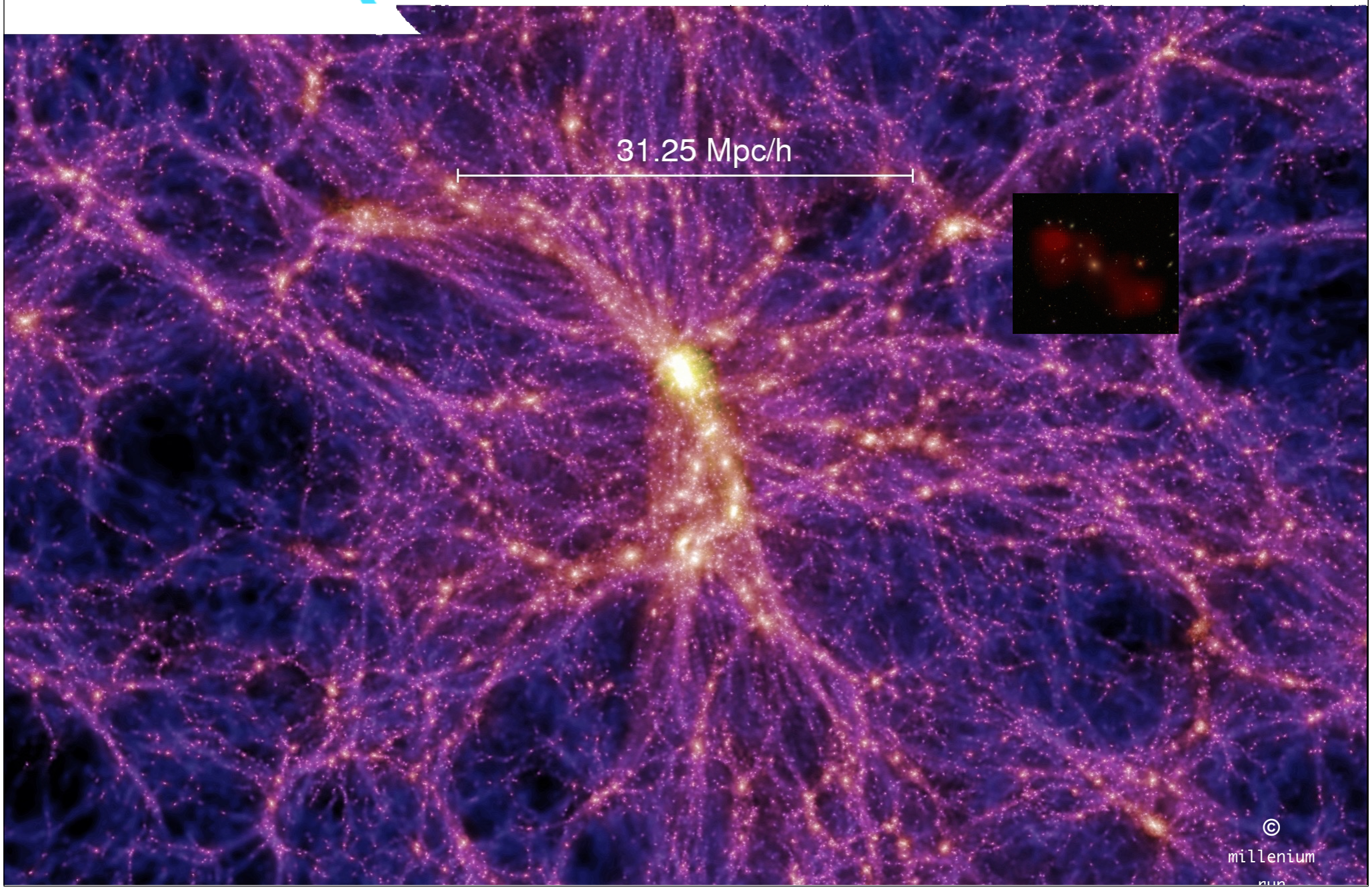
studies over large bandwidth -
essential for proper age characterisation



ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

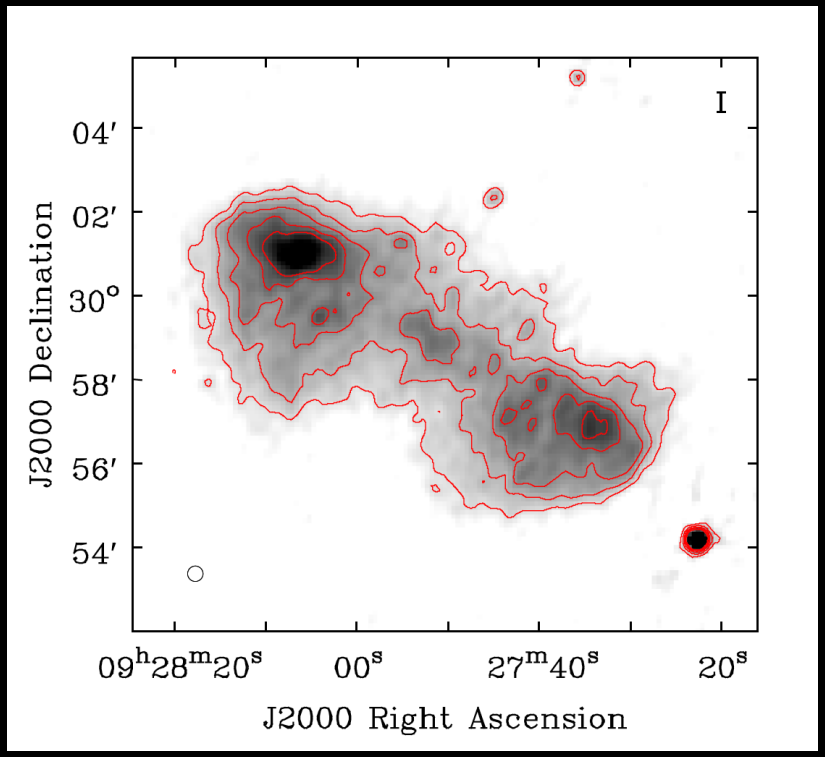


ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

B2 0924+30: relic at z=0.026
host: elliptical galaxy brightest in a small group



22” LOFAR HBA - 140 MHz

ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

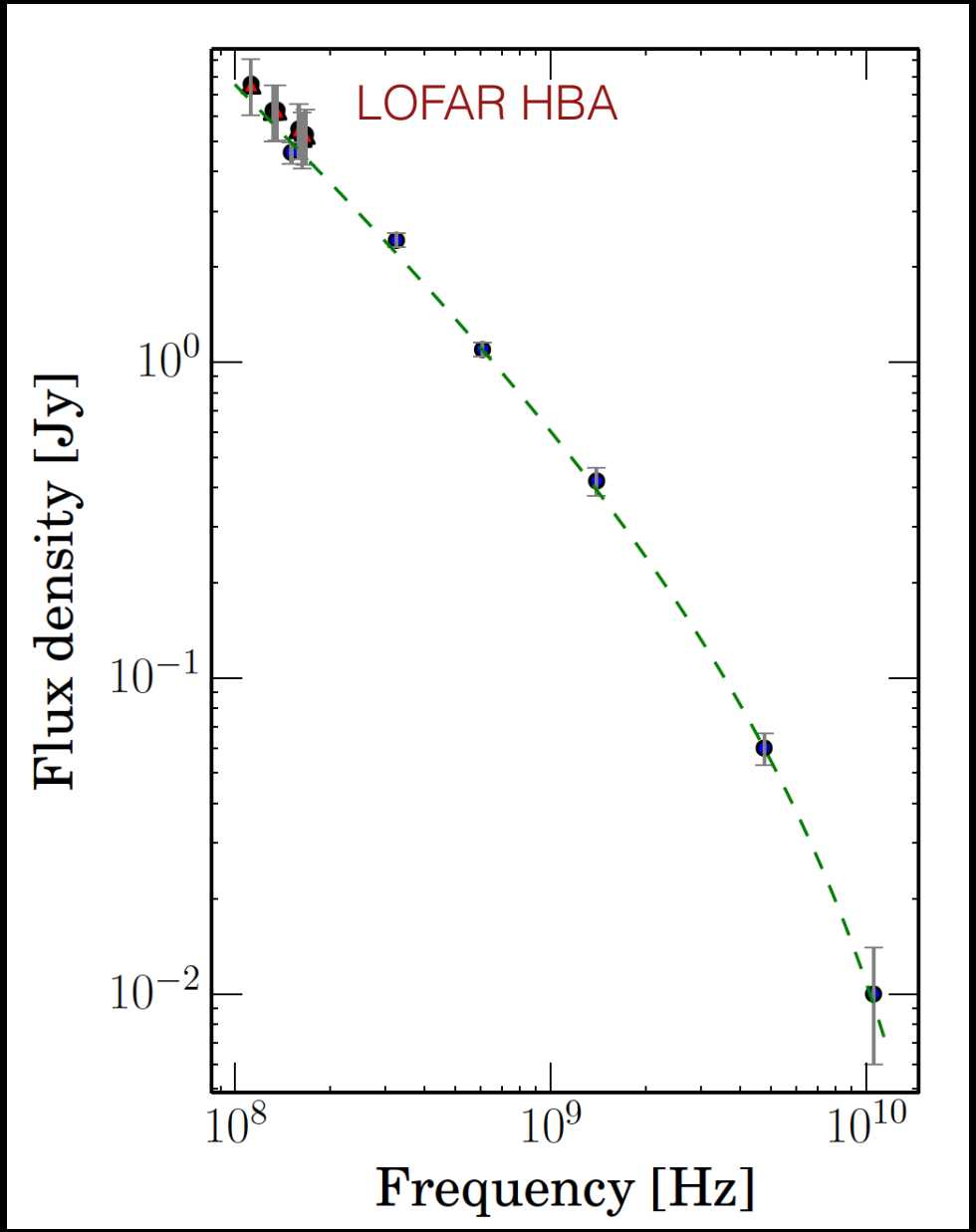
B2 0924+30

Integrated flux density:

Cloff model (Komissarov+ 94):

Toff = 93.5 +- 6.8 Myr
Ton = 54.5 +- 3.5 Myr

injection spectral index:
-0.90 +- 0.07



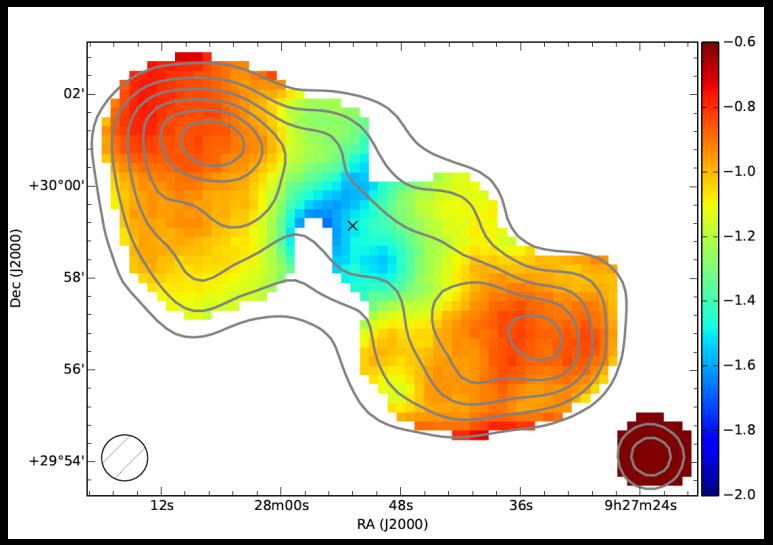
ASTRON

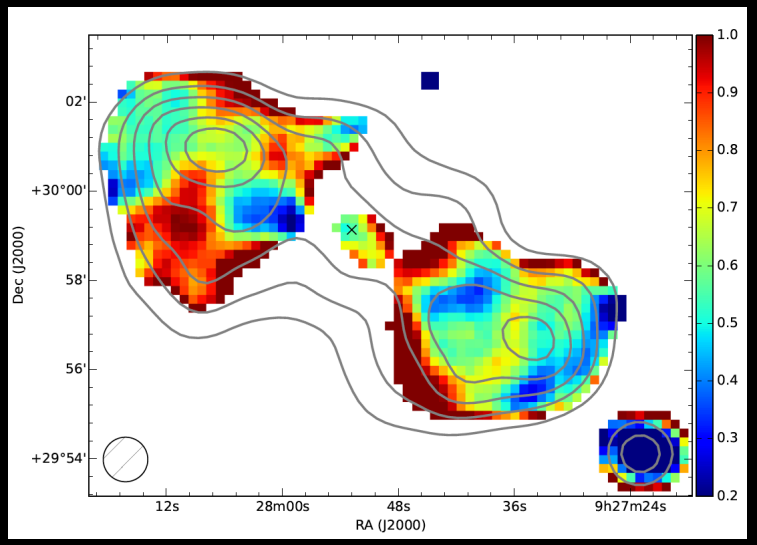
LOFAR

Netherlands Institute for Radio Astronomy

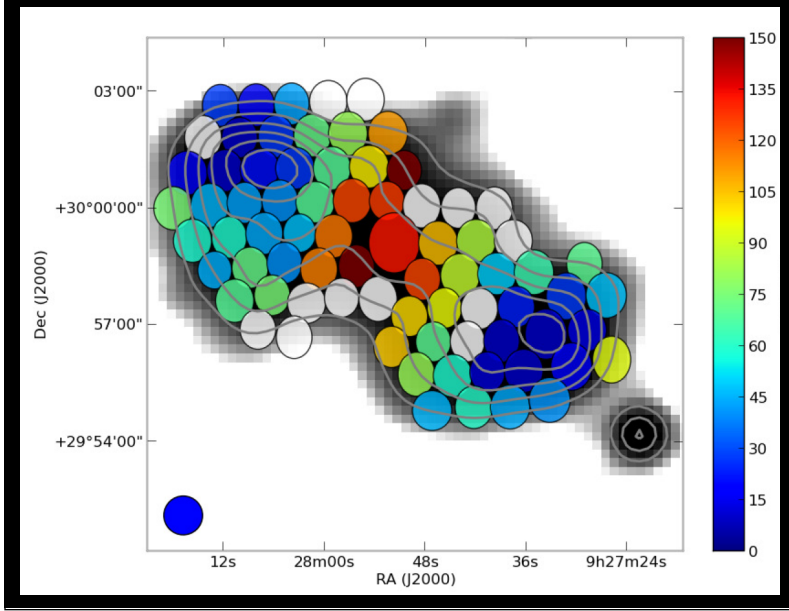
B2 0924+30

140 - 600 MHz
spectral index map





140 - 600 -1400 MHz
spectral curvature map



LOFAR:
high resolution at low frequencies

JP model derived
radiative ages [Myr]
- injection spectral index fixed to -0.9

ASTRON

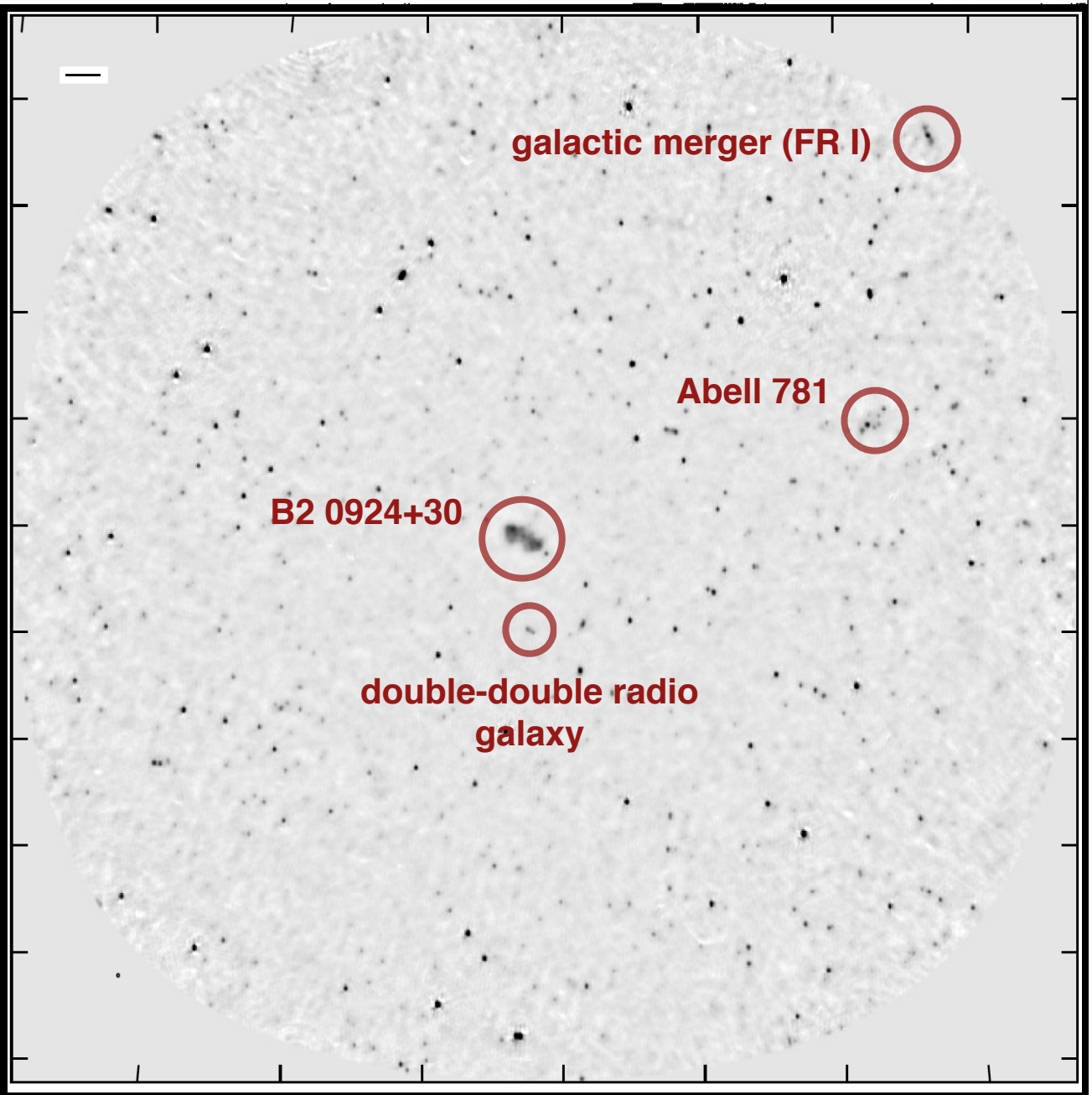
LOFAR

Netherlands Institute for Radio Astronomy

B2 0924+30

LOFAR:
science awaits

28 MHz BW
around 140 MHz
60” x 43”
2.5 mJy/b rms noise

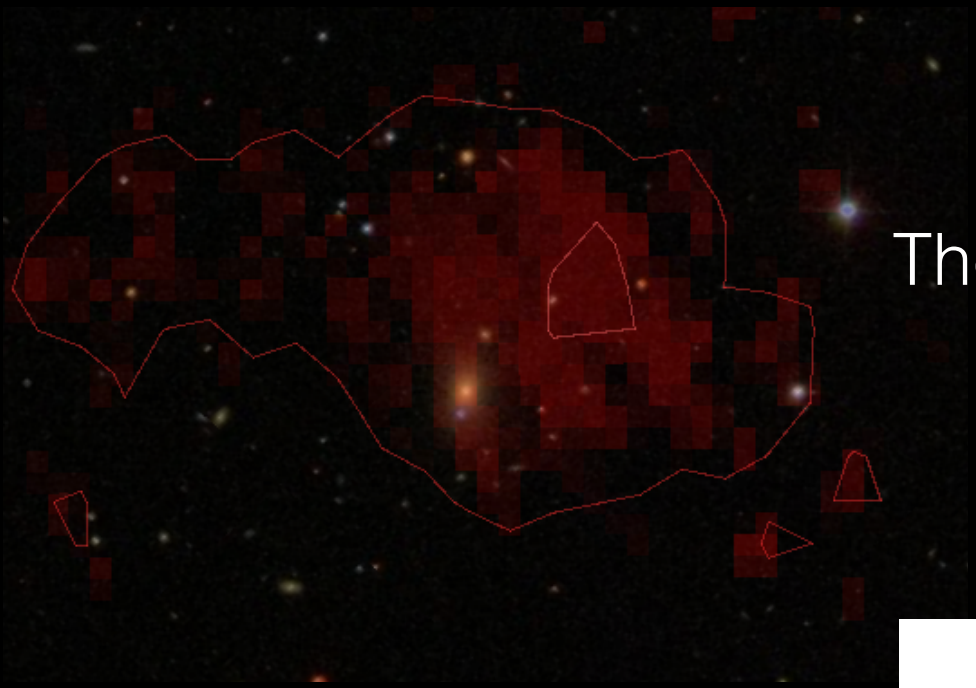


ASTRON

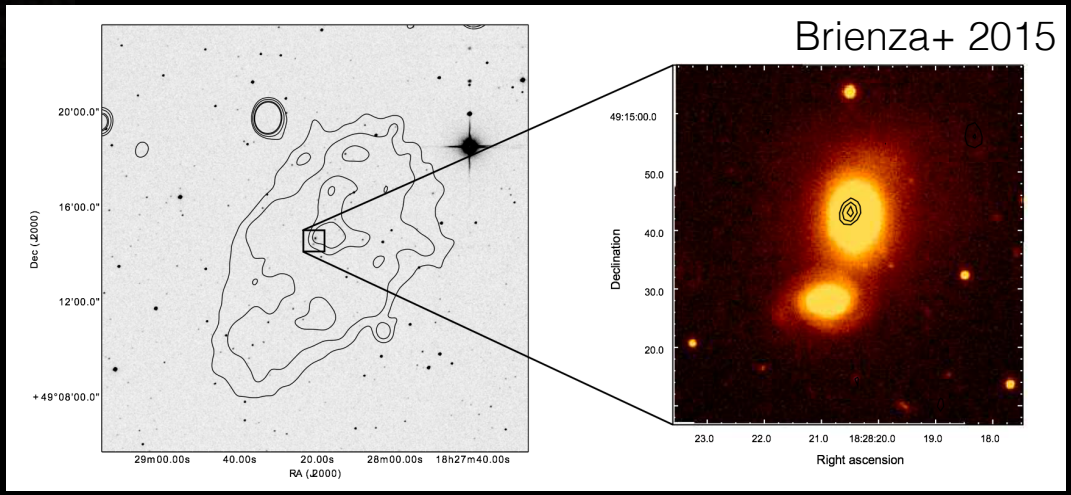
LOFAR

Netherlands Institute for Radio Astronomy

More LOFAR relic discoveries:



The numbers are set to increase in the coming months



ASTRON

LOFAR

Netherlands Institute for Radio Astronomy

Conclusions:

- We can probe the low frequency spectra and use that additional spectral window to put limits on the ages of resolved (nearby) sources.

- Due to the improved resolution at low frequencies, we can characterise the aged particle properties across the source. This allows us to investigate the activity history and determine AGN duty cycles.

- Integrated spectra reflect the detailed properties of a source. Can be used as tracers of activity out to higher redshifts for which current studies (using LOFAR) give a template.