

New projects from the November workshop

- Tutorials on Long-Baseline LOFAR
- Science with LBCS (2 VIRAC staff, Prusis/Nikolajevs + Manchester)
- Observations of 2MASXJ03030042+6605432 (2 VIRAC staff, Steinbergs/Kamisevs + Iacobelli/Orru (ASTRON))



New radio observations of 2MASXJ03030042+6605432

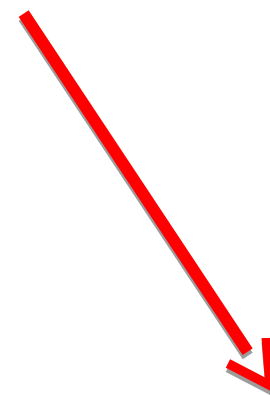
Short notes by M.Iacobelli &
E. Orru

Object detected over a wide
range of wavelengths in
surveys

WISE based photometric
redshift <0.3: nearby
AGN

Not studied in detail so far . . . and at low angular resolution

SPECFIND V2.0 Catalog of radio continuum spectra
(Vollmer+ 2009):
> flattening at low frequency ? To be checked with
TGSS and LOFAR

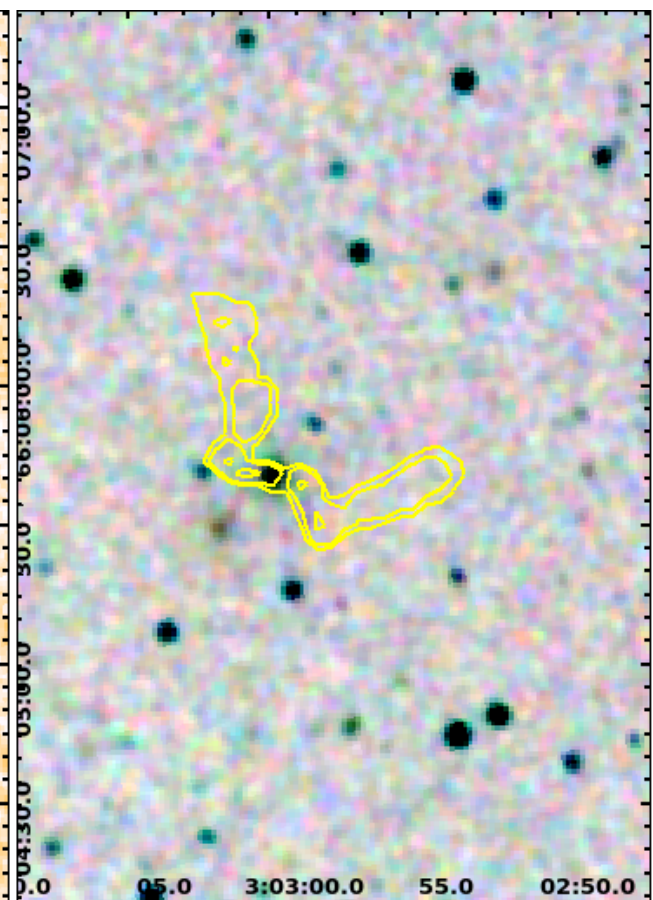
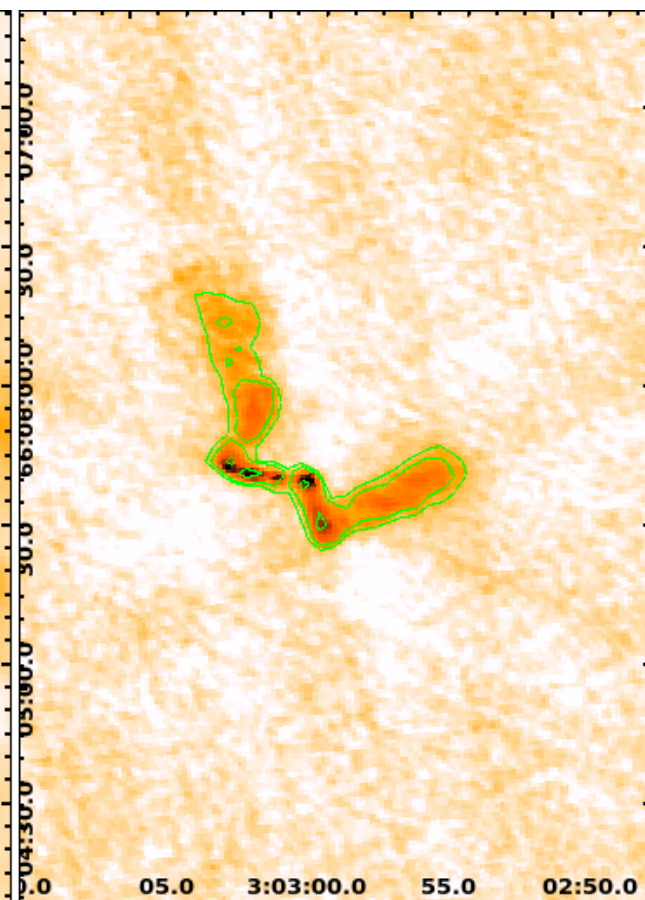
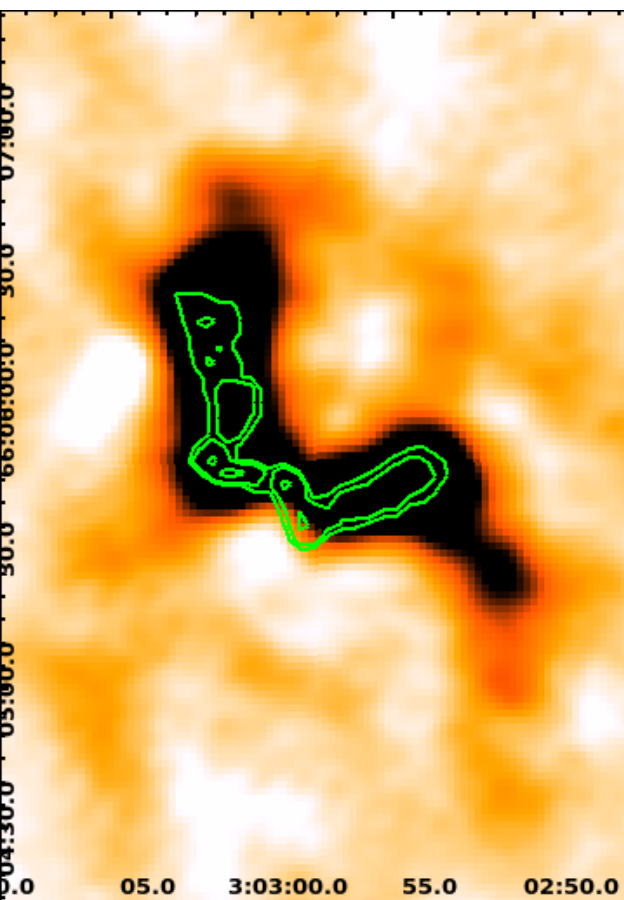


<u>Full</u>	<u>Seq</u>	<u>n</u>	<u>Name</u>	<u>N</u>	<u>a</u>	<u>b</u>	<u>nu</u>	<u>S(nu)</u>	<u>e</u>	<u>RAJ2000</u>	<u>DEJ2000</u>	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	<u>beam</u>
						[mJy]	MHz	mJy	mJy	deg	deg				arcsec
<u>1</u>	<u>9506</u>	<u>6</u>	<u>GB6</u> B0258+6554	7	-0.83	5.12	4850	1.21e+02	2.4e+01	045.7550	+66.1025	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	108.00
<u>2</u>	<u>9506</u>	<u>6</u>	<u>87GB</u> 025841.3+655423	7	-0.83	5.12	4850	1.35e+02	2.7e+01	045.7567	+66.1025	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	138.00
<u>3</u>	<u>9506</u>	<u>6</u>	<u>BWE</u> 0258+6554	7	-0.88	5.24	4850	1.02e+02	2.0e+01	045.7587	+66.1025	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	138.00
<u>4</u>	<u>9506</u>	<u>6</u>	<u>WN</u> B0258.6+6554	7	-0.83	5.12	325	1.14e+03	2.3e+02	045.7454	+66.0972	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	12.00
<u>5</u>	<u>9506</u>	<u>6</u>	<u>NVSS</u> J030259+660550	7	-0.83	5.12	1400	3.36e+02	6.7e+01	045.7471	+66.0974	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	45.00
<u>6</u>	<u>9506</u>	<u>6</u>	<u>MY</u> 025839.9+660609.3	7	-0.81	5.07	232	1.36e+03	2.7e+02	045.7508	+66.1026	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	150.00
<u>7</u>	<u>9506</u>	<u>6</u>	<u>WB</u> 0258+6554	7	-0.88	5.24	1400	3.03e+02	6.1e+01	045.7587	+66.1025	<u>zSim</u>	<u>SED</u>	<u>Radio+Opt</u>	120.00

**LOFAR 150 MHz
+ VLASS
contours**

**VLASS
2.9 GHz**

**2MASS JHK band
+ VLASS
contours**



**Object detected over a wide
range of wavelengths in
surveys**

**WISE based photometric
redshift <0.3 : nearby
AGN**

- Is it a giant radio galaxy ? Need redshift measure
- Which state (restarted)? **Radio spectral index map** & Optical spectrum to get AGN activity signature
- In which environment is located ? Nor a cluster or group of galaxies . .

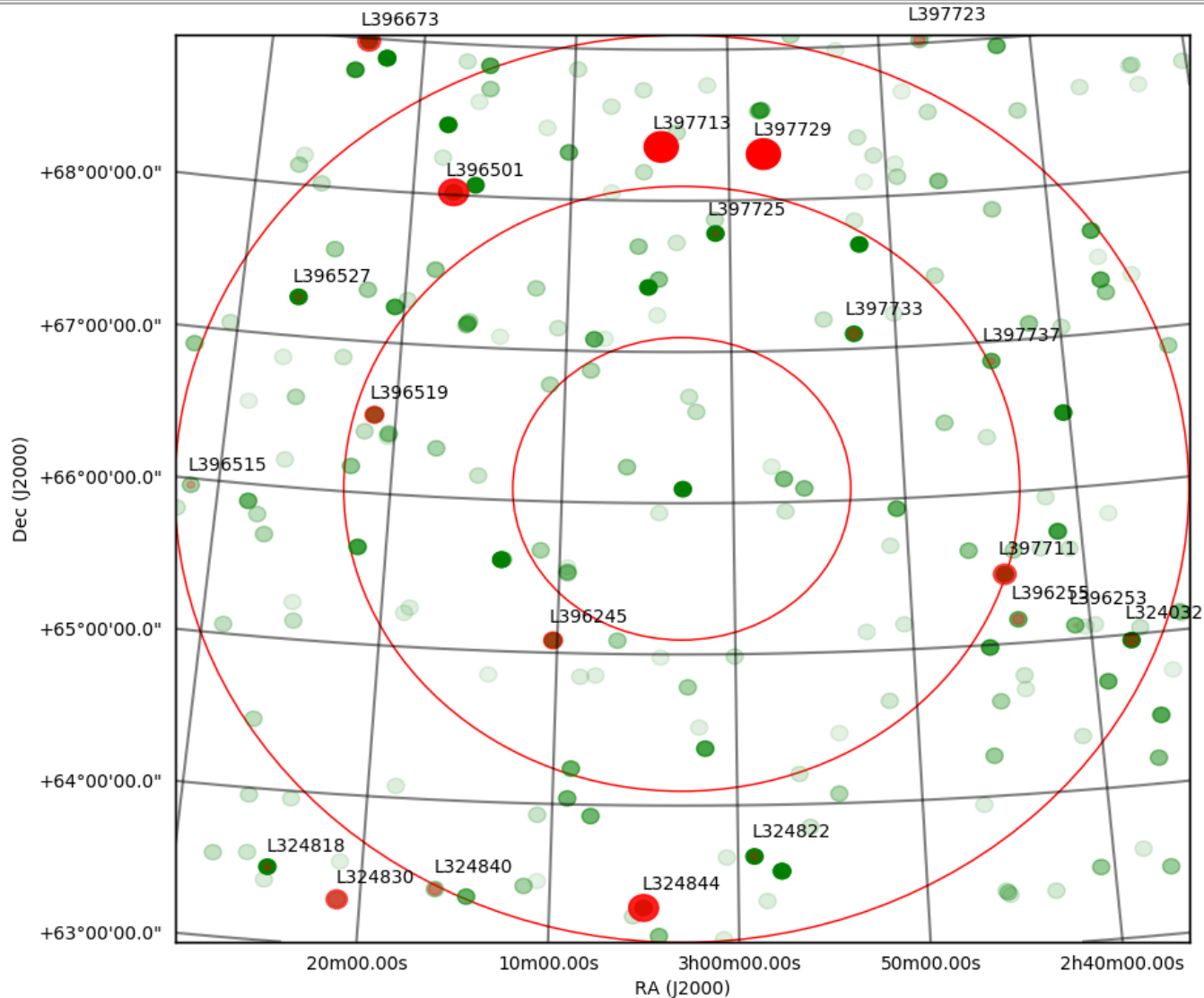
**Object detected over a wide
range of wavelengths in
surveys**

**WISE based photometric
redshift <0.3 : nearby
AGN**

- Which state (restarted)? **Radio spectral index map** & Optical spectrum to get AGN activity signature
 - Process long baseline data to map the target at an angular resolution matching the VLASS one

Find LBCS delay calibrators

47.569042,65.085999,PPPPXSXX----,34,L396245
44.455082,68.308441,PPPPPPPP----,34,L397729



Radio – X-ray correlation function of radio halos in clusters of galaxies

Leaders: E. Orru', M. Iacobelli

Baltics collaborators: J. Steinbergs, F. Kamisevs

OUTLINE

- Radio halos in galaxy clusters
- Goal of the project
- Data processing and quality assessment
- Flux measure and Radio – X-ray Correlation

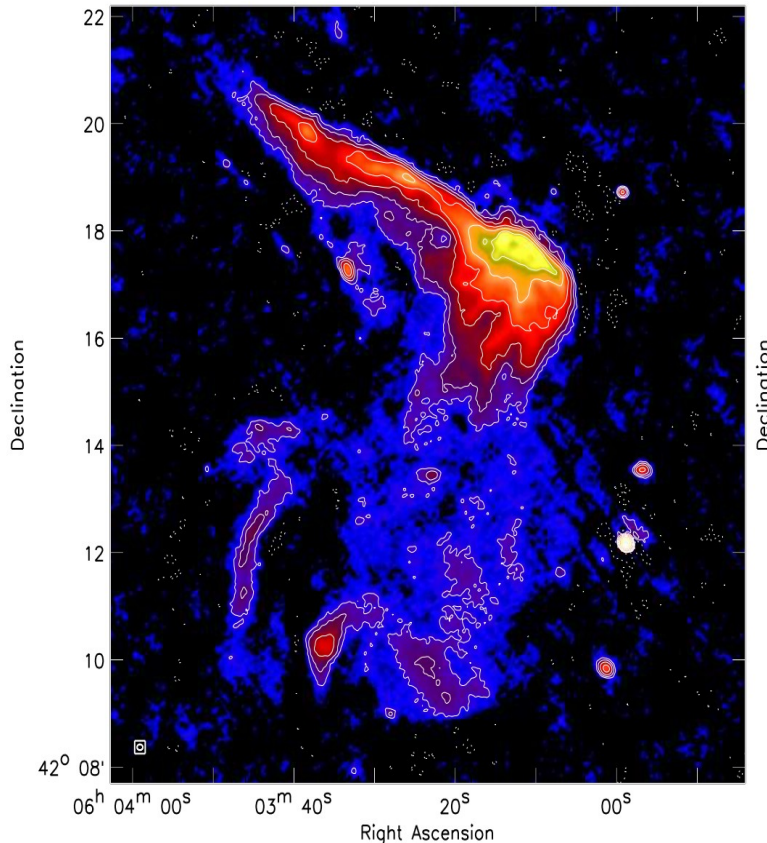
Clusters of galaxies



- Clusters of galaxies: the largest known gravitationally bound structures
- Cluster eco-system: dark matter, galaxies and intra cluster medium (ICM)
- Fields (gravitational, magnetic), thermal and relativistic particles
- Tracers: from radio waves to gamma photons

Radio halos

- diffuse synchrotron emission observed in merging clusters of galaxies
- They are the evidence of relativistic particles and magnetic fields over large scales (1 Mpc)
- Located at the cluster center
- Regular morphology
- Steep radio spectrum ($\alpha < -1$)
- Unpolarized emission
- About 100 of these objects are known so far



Van Weeren et al. 2016

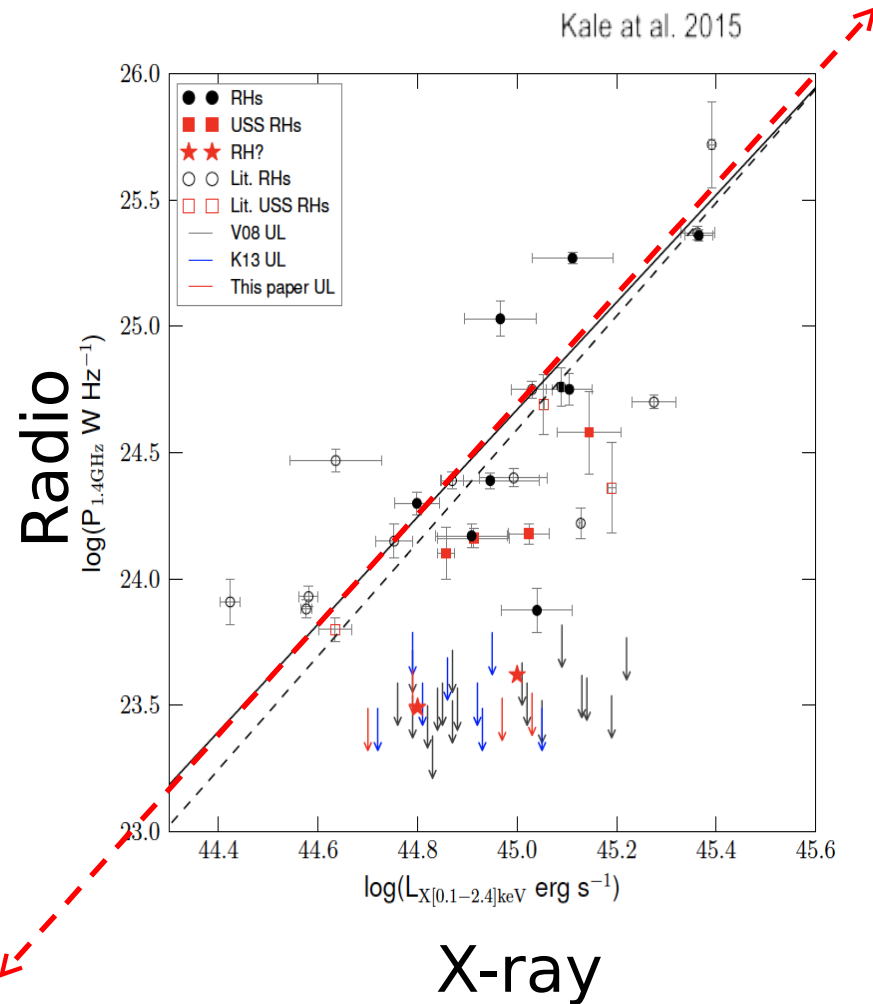
Theoretical models have been proposed to explain their existence but more statistics is needed in order to discriminate among them

A correlation exists between radio at 1.4 GHz (non-thermal i.e. relativistic particles and magnetic field) and X-ray (thermal i.e. gas) emission for radio halos

GOAL OF THE PROJECT



See if the correlation holds at **150 MHz** and expand the parameter space.



Observations at 150 MHz will allow to detect faint objects that have been missed at 1.4 GHz. For this reason LOFAR is crucial in the study of these objects.

Data processing and quality assessment

- The data used for this project will be MSSS data, the shallow survey of LOFAR at 150 MHz (Heald et al 2015).
- Data will be processed using the direction independent calibration pipeline prefactor.
- Quality assessment of the data will be performed in both the uv and image plane using the diagnostic plots produced by prefactor and ad-hoc scripts to evaluate the image quality respectively

Flux measure and Radio – X-ray correlation

- The flux of each radio halo will be measured using the tool pybdsf
- The contribution of compact sources will be removed from the diffuse emission.
- The flux values will be transformed in radio power and placed in the correlation plot

