

MASS Skills Transfer

LaTeX & Overleaf for Beginners



by Zara Randriamanakoto

06 June 2020

what will we cover today?

1/Introducing the concept

2/Highlighting few essential points

3/Contents of a simple latex file

4/Demos using Overleaf

Documentation & Manuals

<https://www.latex-project.org/help/documentation>

https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes

http://pareto.uab.es/jllull/Other_courses/Latex_Beamer.pdf

<http://www.docs.is.ed.ac.uk/skills/documents/3722/3722-2014.pdf>

Practice is **key**!

“You practice and you get better. It’s very simple”
- Phillip Glass

LaTeX

- * A typesetting system that allows you to create scientific documents of **high quality**.
- * Available as **free** software for most operating systems
- * A LaTeX document is a plain text file with a **.tex** file extension. You have to compile your document into another format (*.pdf/ps).
- * With a flexibility introducing **mathematical concepts**.
- * User can arbitrary use **any text editor**, though it is easier to use dedicated LaTeX editors (e.g. kile and kate for Linux, TeXworks for Windows, Texmaker and LyX for both OS systems).

The concept

INPUT

.tex : The manuscript text with interspersed $T_E X$ commands.
.eps, .pdf, .jpg, etc : graphics files.
.bib: bibliography.



PROCESS/COMPILE

Latex.exe
Pdflatex.exe
LuaTeX.exe
XeTeX.exe



OUTPUT

1- **.dvi** or **.pdf**, HTML, XML, etc.
2- **.log**: transcript
3- **.aux**: auxiliary

```
% Please keep new commands to a minimum, and use \newcommand not \def to avoid
% overwriting existing commands. Example:
%\newcommand{\pcm}{\,cm$^{-2}$} % per cm-squared

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% TITLE PAGE %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% Title of the paper, and the short title which is used in the headers.
% Keep the title short and informative.
\title[A remnant radio AGN in the EN1 field]{J1615+5452: a remnant radio galaxy in the ELAIS-N1
field}

% The list of authors, and the short list which is used in the headers.
% If you need two or more lines of authors, add an extra line using \newauthor
\author[Z. Randriamanakoto et al.]{Z. Randriamanakoto1*, C.H. Ishwara-Chandra2, A.R. Taylor3,4,
C.\,H. Ishwara-Chandra2, A.\,R. Taylor3,4}
% List of institutions
1South African Astronomical Observatory, P.O. Box 9, Observatory 7935, South Africa\\
2National Centre for Radio Astrophysics, TIFR, Post Bag No. 3, Ganeshkhind Post, 411007 Pune, India\\
3Inter-University Institute for Data Intensive Astronomy, and Department of Astronomy,
University of Cape Town,\\
Private Bag X3, Rondebosch 7701, South Africa\\
4Inter-University Institute for Data Intensive Astronomy, and Department of Physics and
Astronomy, \\
University of the Western Cape, Private Bag X17, Bellville 7535, South Africa
}

% These dates will be filled out by the publisher
\date{Accepted XXX. Received YYY; in original form 2019 November 30}

% Enter the current year, for the copyright statements etc.
\pubyear{2020}
\hypersetup{draft}
% Don't change these lines
\begin{document}
\label{firstpage}
\pagerange{\pageref{firstpage}--\pageref{lastpage}}
\maketitle

% Abstract of the paper
\begin{abstract}
We report the discovery of a remnant radio AGN J1615+5452
in the field of ELAIS-N1. GMRT
continuum observations at 150, 325 and 610\,MHz combined with archival data from the 1.4\,GHz
NVSS survey
```

INPUT

J1615+5452: a remnant radio galaxy in the ELAIS-N1 field

Z. Randriamanakoto¹*, C.H. Ishwara-Chandra², A.R. Taylor^{3,4}

¹South African Astronomical Observatory, P.O. Box 9, Observatory 7935, South Africa

²National Centre for Radio Astrophysics, TIFR, Post Bag No. 3, Ganeshkhind Post, 411007 Pune, India

³Inter-University Institute for Data Intensive Astronomy, and Department of Astronomy, University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa

⁴Inter-University Institute for Data Intensive Astronomy, and Department of Physics and Astronomy, University of the Western Cape, Private Bag X17, Bellville 7535, South Africa

Accepted XXX. Received YYY; in original form 2019 November 30

ABSTRACT

We report the discovery of a remnant radio AGN J1615+5452 in the field of ELAIS-N1. GMRT continuum observations at 150, 325 and 610 MHz combined with archival data from the 1.4 GHz NVSS survey were used to derive the radio spectrum of the source. At a redshift $z \sim 0.33$, J1615+5452 has a linear size of ~ 100 kpc and spectral indices ranging between $\alpha_{610}^{1400} < -1.5$ and $\alpha_{150}^{325} = -0.61 \pm 0.12$. While the source has a diffuse radio emission at low frequencies, we do not find evidence of core, jets or hotspots in the 1.4 GHz VLA data of ~ 5 arcsec angular resolution. Such morphological properties coupled with a curved radio spectrum suggest that the AGN fueling mechanisms undergo a shortage of energy supply which is typical of a dying radio AGN. This is consistent with the observed steep curvature in the spectrum $\Delta\alpha \approx -1$, the estimated synchrotron age of $t_s = 76.0^{+7.4}_{-8.7}$ Myr and a t_{ed}/t_s ratio of ~ 0.3 .

Key words: galaxies: active – galaxies: individual: J1615+5452 – radio continuum: galaxies.

1 INTRODUCTION

In the active stage which usually lasts ~ 10 – 100 Myr (Cordey 1986), the classical morphology of a radio galaxy is characterized by the presence of a core, a pair of lobes and including jets, and/or hotspots. Such features indicate the continuous injection (CI) of relativistic electrons that fuel the active galactic nuclei (AGN). Following the active phase of the radio AGN, the source enters the so-called remnant or dying phase, as the nuclear engine switches off and the compact radio components, typical signatures of current activity, eventually disappear (Parma et al. 1999; Slee et al. 2001; Kapińska et al. 2010; Morganti 2017).

Despite the challenges of detecting radio AGNs in their remnant phase, especially prior to the era of low frequency radio facilities such as the Giant Metrewave Radio Telescope (GMRT, Swarup 1991), the Low-Frequency ARray (LOFAR, van Haarlem et al. 2013) and the Murchison Widefield Array (MWA, Lonsdale et al. 2009; Tingay et al. 2013), Cordey (1987) made a breakthrough when reporting the first discovery of a dying AGN known as B2 0924+30. Since then, this prototype of genuine radio remnants hosted by IC 2476 has been the subject of follow-up studies (Jamroz et al. 2004; Shulevski et al. 2017; Turner 2018). Meanwhile, other

sources of this type have now been found in wide-field radio surveys (e.g. Parma et al. 2007; Murgia et al. 2011; Saripalli et al. 2012; de Gasperin et al. 2014; Brienza et al. 2016, 2017; Mahatma et al. 2018; Duchesne & Johnston-Hollitt 2019).

The switching off of the central AGN activity is translated into a steep spectrum $\alpha < -1.3$ ($S \propto \nu^\alpha$, e.g. Komissarov & Gubanov 1994; Parma et al. 2007; Shulevski et al. 2017) of the associated radio emission in the GHz frequency regime, according to radiative ageing models (e.g. Kardashev 1962; Pacholczyk 1970; Jaffe & Perola 1973). This is because the injected relativistic electrons lose energy with time due to both synchrotron emission and Inverse Compton scattering with the Cosmic Microwave Background (CMB) photons (Komissarov & Gubanov 1994). Since higher energy electrons lose energy more quickly and have shorter radiative lifetimes, this results in a high-frequency turn down of the synchrotron spectrum occurring beyond a break frequency ν_b that drifts in time to lower frequencies. Below the break frequency, the radio spectrum of the non-active source has a spectral injection index, α_{inj} , typically in the range -0.5 to -1 (e.g. Blandford & Ostriker 1978; Murgia et al. 2011; Brienza et al. 2016), while above ν_b , the spectral index α is steeper than $\alpha_{\text{inj}} - 0.5$ (Kardashev 1962; Pacholczyk 1970; Jaffe & Perola 1973).

Searches for remnant radio AGNs are generally based on detection of ultra-steep spectra at low frequencies (e.g.

* E-mail: zara@sao.ac.za

OUTPUT
(MNRAS article)

A relic radio AGN in the field of ELAIS-N1

Zara Randriamanakoto^{1,2}, C.H. Ishwara-Chandra³, A.R. Taylor^{2,4}

zara@sao.ac.za

¹South African Astronomical Observatory, Cape Town, South Africa

²Inter-University Institute for Data Intensive Astronomy and Department of Astronomy, University of Cape Town, Cape Town, South Africa

³National Centre for Radio Astrophysics, TIFR, Pune, India

⁴Inter-University Institute for Data Intensive Astronomy and Department of Physics, University of the Western Cape, Cape Town, South Africa



A0 POSTER

Summary

We report the discovery of a remnant radio AGN J1615+5452 in the field of ELAIS-N1. GMRT continuum observations at 150, 325 and 612 MHz along with archival data from the 1.4 GHz NVSS survey were used to derive the radio spectrum of the source. At a redshift $z = 0.33$, J1615+5452 has a linear size of 0.11 Mpc and a steep spectral α (1400/150) = 1.12. While the source has a diffuse radio emission at low frequencies, we do not find evidence of core, jets or hotspots in the 1.4 GHz VLA data of 5 arcsec angular resolution. Such morphological properties and the existence of a spectral break frequency at $\nu_b = 461$ MHz suggest that the AGN fueling undergoes a shortage of energy supply which is typical of a dying/relic radio AGN. This is consistent with the estimated synchrotron age of 90 Myr old.

Introduction

In the active stage which usually lasts $\sim 10 - 100$ Myr (Cordey 1986), the classical morphology of a radio galaxy is characterized by the presence of a core, a pair of lobes and clear jets, and/or hotspots.

$$cz = H(z)r + v_{pec} + cz_{gr} \quad (1)$$

El corrimiento al rojo gravitacional z_{gr} , basado en datos de archivo, es menor en comparación al corrimiento Doppler v_{pec} hasta por dos órdenes de magnitud, para masas $\sim 10M_{\odot}$ (Wojtak, 2014). Sin embargo, su carácter ligado a los pozos de potencial gravitacional (2) logra convertirlo en un fenómeno

que pone a prueba las teorías para la gravedad dentro de la cosmología.

$$z_{gr} = \frac{\Delta\lambda'}{\lambda} = \frac{\Delta\Phi}{c^2} \quad (2)$$

ELAIS-N1 with GMRT

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Zara

RA (J2000)	16h15m31.1s
DEC (J2000)	+54d52m28s
z	0.32936
$\alpha_{150}^{(100)}$	-1.12 ± 0.06
$\alpha_{612}^{(100)}$	-1.58 ± 0.15
$\alpha_{612}^{(150)}$	-1.12 ± 0.11
$\alpha_{150}^{(612)}$	-0.61 ± 0.12
$L_{1.4GHz}$	$3.17 \times 10^{24} \text{ W Hz}^{-1}$
L_{612}	$1.85 \times 10^{11} L_{\odot}$
q	0.88
$SFR_{1.4GHz}$	$\sim 135 M_{\odot} \text{ yr}^{-1}$

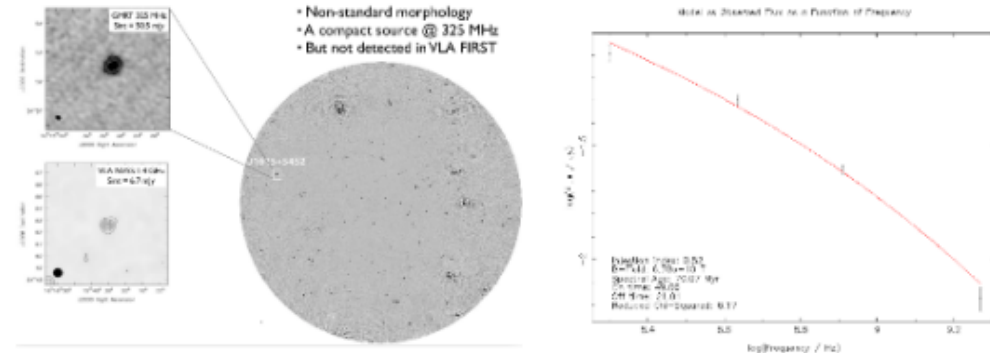


Figure 1: Perfil del corrimiento hacia el azul en las fronteras de los cúmulos galácticos en función de la distancia al centro del cúmulo R. Se grafica para Relatividad General (GR) en rojo y para las teorías de gravedad modificada en azul (de corrido $f(R)$, punteado TeVeS). TeVeS es la que se aleja más de los resultados apuntados por la GR.

Spectral ageing

Wojtak (2014) compara el perfil para las tres teorías de gravedad de arriba para un corrimiento de la luz hacia el azul dado como:

$$\Delta(R) = \int \frac{\Delta\lambda(R)S(R)dN/dM_{\odot}dM_{\odot}}{S(R)dN/dM_{\odot}dM_{\odot}} \quad (3)$$

donde el perfil del corrimiento al rojo gravitacional para un cúmulo galáctico en singular es:

Conclusions & Future work

The morphological characteristics of J1615+5452 coupled with its spectral properties helped us to classify the peculiar source as a dying radio galaxy with a single past episode of AGN activity. Adopting such selection criteria is key to identify genuine relic candidates which play an important role toward a comprehensive understanding of AGN evolution. With the upgraded GMRT and the MeerKAT radio telescope network, we intend to

REFERENCES

References

1. Cordey 1986. . . Croft, Rupert A. C. "Gravitational redshifts from large-scale structures." *Mon.Not.Roy.Astron.Soc.* 434 (2013): 3008-3017.
2. Wojtak, B., Hansen, S. & Horesh, E. "Gravitational redshift of

MASS Skills Transfer, Webinar,
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PRESENTATION

LaTex for beginners



Zara Randriamanakoto

✉ zara@sao.ac.za

🏛 South African Astronomical Observatory, RSA

Few essential points

Document type: `\documentclass{?}`



Academic Journal



Bibliography



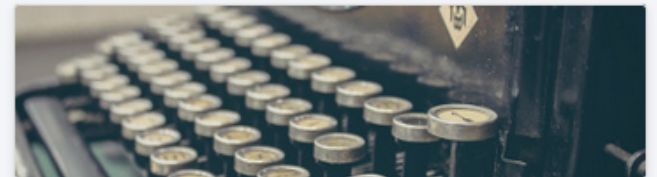
Book



Calendar



Résumé / CV



Formal Letter



Homework Assignment



Newsletter



Poster



Presentation



Project / Lab Report



Thesis

Few essential points

1/Specify the format: `\documentclass{?}`

2/Define your document structure

3/Load the package you wish to use: `\usepackage{?}`
e.g. Figure -> `graphicx`

4/Add your title: `\maketitle`

5/Keep track of the changes by compiling the text editor

Contents of a simple LaTeX file

`\documentclass{?}`
`\usepackage{}`

`\title`
`\author`
`\date`

`\begin{document}`
`\maketitle`

`\section{}`

`\subsection{}`

`\subsection{}`

`\end{document}`

```
\documentclass{article}
\usepackage{graphicx}

\begin{document}

\title{Introduction to \LaTeX{}}
\author{Author's Name}

\maketitle

\begin{abstract}
The abstract text goes here.
\end{abstract}

\section{Introduction}
Here is the text of your introduction.

\begin{equation}
\label{simple_equation}
\alpha = \sqrt{\beta}
\end{equation}

\subsection{Subsection Heading Here}
Write your subsection text here.

\begin{figure}
\centering
\includegraphics[width=3.0in]{myfigure}
\caption{Simulation Results}
\label{simulationfigure}
\end{figure}

\section{Conclusion}
Write your conclusion here.

\end{document}
```

Overleaf

- * An online LaTeX editor, url: <https://www.overleaf.com>
- * Really help for a collaborative writing and publishing
- * You can retrieve/download your source anytime and work offline
- * Overleaf provides a template library!
- * Free to use with a quick sign-up and nothing to install



Demos using Overleaf

Let's log in and try it out!

Adding:

- a title
- a text
- a comment & spacing
- a mathematical concept (e.g. equation)
- a figure
- a bibliography (reference)