



CRITERIA-3
3.5 Collaboration

**3.5.1: MOUs/Linkages/Collaboration
2019-20.**

**Linkage between Department of Physics Vs Inter University Center
for Astronomy and Astrophysics (IUCAA)**

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Prof. A. N. Ramaprakash
Dean, Visitor Academic Programmes

June 23, 2023.

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Dr. Biju K.G., an Associate Professor from W.M.O. Arts and Science College, Muttill, Wayanad, Kerala, visited the Inter-University Centre for Astronomy and Astrophysics (IUCAA) during the following dates under IUCAA's Visitor Programme.

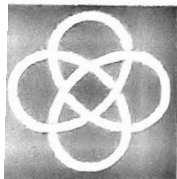
1. From October 29, 2017 till November 10, 2017.
2. From April 23, 2018 till May 22, 2018.
3. From December 27-31, 2018.
4. From July 20-22, 2019.

He worked under the able guidance of Professor Joydeep Bagchi, formerly a faculty member at this Centre and used the computing and library facilities at IUCAA for his research work.

IUCAA has paid him TA and DA as per norms, wherever applicable.

Prof. A.N. Ramaprakash
Dean, Visitor Academic Programmes
<anr@iucaa.in>

Prof. A. N. Ramaprakash
Scientist-H (Sr. Professor)
Dean, Visitor Academic Programmes
Head, Instrumentation
IUCAA, Pune-411007, INDIA



अंतर-विश्वविद्यालय केंद्र : खगोलविज्ञान और खगोलभौतिकी

IUCAA

Inter-University Centre For Astronomy And Astrophysics

An Autonomous Institution of the University Grants Commission

Prof. Kandaswamy Subramanian

Dean, Visitor Academic Programmes

August 5, 2019

By Speed-Post

Dr. K.G Biju,
Associate Professor,
Department of Physics,
WMO Arts & Science College,
Muttill P.O., Wayanad,
Kerala - 673 122.

Dear Dr. Biju,

It gives me great pleasure to invite you, on behalf of the Governing Board and Director of IUCAA to become a Visiting Associate of IUCAA from August 1, 2019 for a period of three years. I hope that you will be able to accept this invitation.

The purpose of the Associateship Programme is to help university and college faculty members in their research projects and to encourage interaction between them and the IUCAA faculty. Those selected as Visiting Associates are encouraged to visit IUCAA regularly and to actively participate in the Centre's programmes.

I am enclosing along with this letter of invitation (1) a copy of the letter I have sent to the Principal of your College, explaining the programme and requesting him/her to treat your visits to IUCAA under this programme as "on duty", (2) a copy of a letter sent in September 2, 2004 to the Vice-Chancellors of different universities by Professor Arun Nigavekar, the then Chairman of the University Grants Commission (UGC). You may use these letters when you apply for leave for visits to IUCAA, if you find that necessary.

I shall look forward to your response to this letter of invitation and hope that IUCAA will benefit from your regular visits, participation and advice. The Terms and Conditions of the Associateship Programme are enclosed along with this letter.

With kind regards,

Sincerely,

Kandaswamy Subramanian

Professor Kandaswamy Subramanian

Encl : (1) Copy of the letter sent to the Principal of your College; (2) Copy of the letter sent by UGC; (3) Terms and Conditions of the Associateship Programme.



अंतर-विश्वविद्यालय केंद्र : खगोलविज्ञान और खगोलभौतिकी

IUCAA

Inter-University Centre For Astronomy And Astrophysics

An Autonomous Institution of the University Grants Commission

of. Kandaswamy Subramanian

gn. Visitor Academic Programmes

August 5, 2019.

The Principal,
WMO Arts & Science College,
Muttill Po, Wayanad,
Kerala-673122.

Dear Sir / Madam,

As you are aware, the Inter-University Centre for Astronomy and Astrophysics (IUCAA) has been set up by the University Grants Commission (UGC) to promote and nucleate astronomy and astrophysics in the universities and affiliated colleges. To this end, IUCAA has launched a number of programmes on its campus at Pune and also on the campuses of various universities and colleges. In particular, arrangements have been made to facilitate the usage by interested students and faculty of universities and colleges of centralized facilities at Pune, such as an advanced Computer Centre with High Performance Computing facility, a state-of-the-art library, the Instrumentation Laboratory and observational facilities including the South African Large Telescope (SALT) at Sutherland. IUCAA is also involved in a number of large projects of national and international importance like ASTROSAT, LIGO-India, the Thirty Metre Telescope, etc.

One major activity in this context is the **Associateship Programme**. Under this programme, faculty members of universities and colleges, who are made **Visiting Associates of IUCAA**, can make visits to IUCAA for specified periods to participate in the teaching and research and development activities in astronomy and astrophysics. For such purposes, the universities and colleges are encouraged to regard IUCAA as their field station, whose facilities are at their disposal. Indeed, Professor Arun Nigavekar, the then Chairman of the UGC, has written in 2004 to all the university Vice-Chancellors urging them to look upon IUCAA in this spirit and to make it possible for the Visiting Associates to use its facilities to the maximum extent possible. I enclose for your ready reference a copy of this letter from the Chairman.

As part of the Associateship Programme, IUCAA has selected 20 new Visiting Associates this year and has extended the term of 38 Visiting Associates for a further period of three years. I am happy to inform you that **Dr. K.G Biju** from your College has been selected a Visiting Associate for three years from August 1, 2019. Under the Associateship Programme, IUCAA will pay the travel and per diem of the Visiting Associates coming to IUCAA for their scientific work.

I do hope that you will encourage Dr. Biju to take advantage of this offer. I request you to treat Dr. Biju's stay at IUCAA as a part of his duties and to provide him with leave as "on duty" so that he can make good use of his Associateship. I enclose the Terms and Conditions of the Associateship Programme for your information.

With kind regards,

Sincerely,

Kandaswamy Subramanian

Prof. Kandaswamy Subramanian

Encl : (i) UGC Chairman's Letter. (ii) Terms and Conditions of Associateship Programme.
cc : Dr. K.G Biju, Department of Physics, WMO Arts & Science College, Kerala-673122.

2. ACTIVITY REPORT

1. A poster Paper entitled “ GMRT unveils the longest uninterrupted ~600 Kpc jet of a Giant radio galaxy” has been accepted for a poster contribution at *A Centenary of Astrophysical Jets: Observation, Theory, and Future Prospects*, with Joydeep Bagchi and Pratik Dabade of IUCAA as co- Authors.
 - (a) Email communication from the organizers.

7/8/23, 10:55 AM

Gmail - Jets Conference Poster Contribution



Biju koonammakkil george <kgbiju42@gmail.com>

Jets Conference Poster Contribution

2 messages

Emma Alexander <emma.alexander@manchester.ac.uk>
To: "kgbiju42@gmail.com" <kgbiju42@gmail.com>

Thu, Jun 20, 2019 at 8:19 PM

Dear Dr Biju KG,

I am pleased to inform you that your submitted abstract titled "GMRT unveils the longest uninterrupted ~600 Kpc jet of a Giant radio galaxy" has been accepted for a poster contribution at *A Centenary of Astrophysical Jets: Observation, Theory, and Future Prospects*.

Please confirm at your earliest convenience that you would like to present this poster at the conference by replying to this email or to jetsloc@b.man.ac.uk.

Details regarding the conference schedule and other logistics will be circulated in due course.

Kindest regards,

Emma Alexander
On behalf of the SOC and LOC

Biju koonammakkil george <kgbiju42@gmail.com>
To: Emma Alexander <emma.alexander@manchester.ac.uk>, jetsloc@b.man.ac.uk

Thu, Jun 20, 2019 at 11:36 PM

Dear all,

Thanks a lot for accepting my abstract titled "GMRT unveils the longest uninterrupted ~600 Kpc jet of a Giant radio galaxy."

I am attending the conference, and I would like to present this poster there.

With regards

Biju

[Quoted text hidden]

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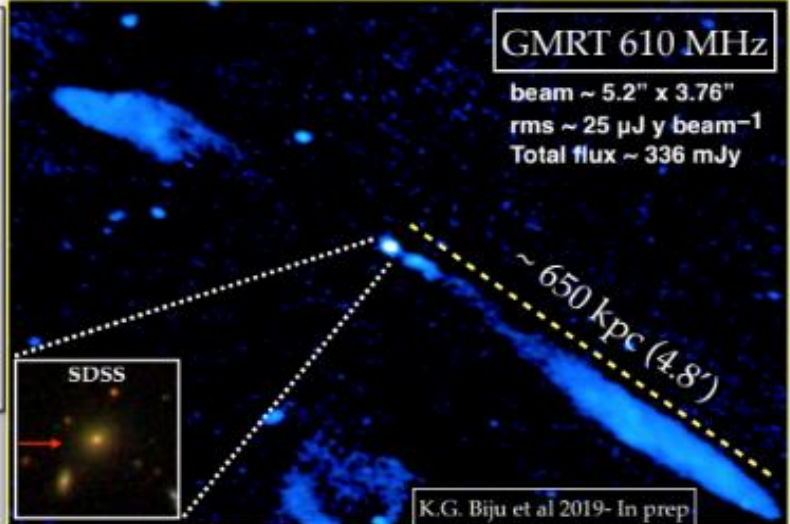
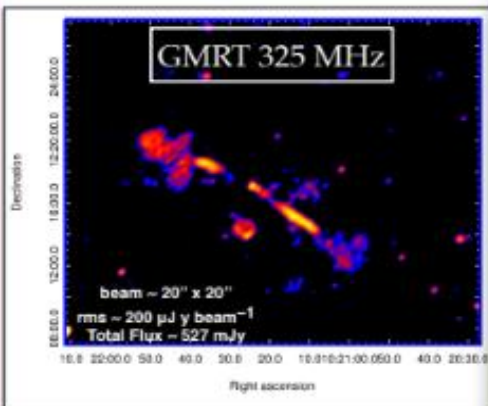
BIJU.K.G
DEPARTMENT OF PHYSICS
W.M.O.ARTS &SCIENCE COLLEGE
MUTTIL PO , NORTH KALPETTA
WAYANAD, KERALA
PHONE:04936 246869
09447546217

(b)Poster paper presented in the conference.

GMRT unveils the longest uninterrupted ~650 kpc jet of a Giant radio galaxy

KG Biju (WMO Arts & Science college, Muttai, Kerala, India), **Joydeep Bagchi** (IUCAA, India), **Joe Jacob** (Newman College, Thodupuzha, Kerala, India), **Pratik Dabhade** (IUCAA & Leiden Observatory), **C.H Ishwar Chandra** (NCRA-TIFR), **Bhargav Vaidya** (IIT-Indore, India), **Shishir Sankhyayan** (IISER-Pune, India) and **Mahadev Pandge** (Dayanand Science College, Latur, India)

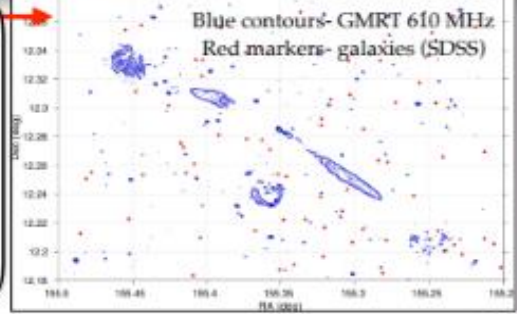
Abstract : The physics of the launching and propagation of relativistic jets in AGNs is a major area of research in radio astrophysics. While the mass of the black hole, its spin and the rate of accretion of matter into the blackhole are known to influence the formation of jets, the jet power, the environment and the age are the factors which decide how far the jet propagates. Here we present our interesting findings based on GMRT observations of the GRG 2MASXJ10212421+1217060 (redshift $z = 0.129$). The giant source has a total linear size of 2.2Mpc and shows an uninterrupted radio jet of length ~600kpc, making it the longest jet known so far. Uninterrupted jets of these scales are very rare and provide an ideal laboratory to study jet-medium interaction on longer length scales. The radio morphology shows clear signatures of episodic activity, and it appears that the jet from the second episode of activity is traversing through the diffused relics from the previous epoch. The influence of the age of the source, episodic activity, nature of the host galaxy, the jet power and the environment in the formation of this jet are presented.



Property	Value
Host galaxy RA & DEC	10:21:24.21, +12:17:06.44
Host galaxy type	elliptical (E2)
Redshift (z)	0.129
H_α luminosity	$4.2 \times 10^{43} \text{ erg s}^{-1}$
Excitation Index	-0.36 (LERG)
M_{gas}	$3.8 \times 10^8 M_\odot$
$S_{\text{radio}}(8.6 \text{ GHz})$	136
P_{kinetic}	$6.33 \times 10^{24} \text{ W Hz}^{-1}$
Largest angular size	4.8'
Projected linear size	2.2 Mpc
Spectral index (α_{325}^{610})	0.71
Spectral index (α_{150}^{325})	0.91
Kinetic jet power (Q_j)	$6 \times 10^{42} \text{ erg s}^{-1}$

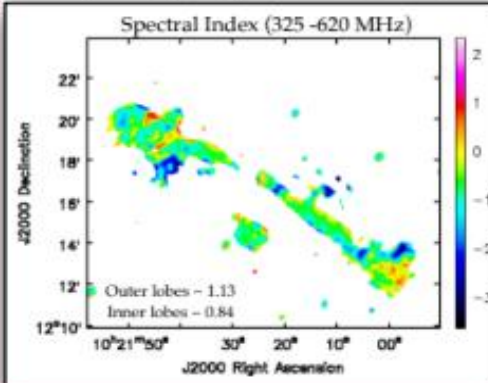
Effect of Environment

- The figure shows the 610 MHz radio map of the source, plotted with the surrounding galaxies within redshift 0.129 ± 0.05 .
- It shows that the jet appears to be propagating through a sparse environment.

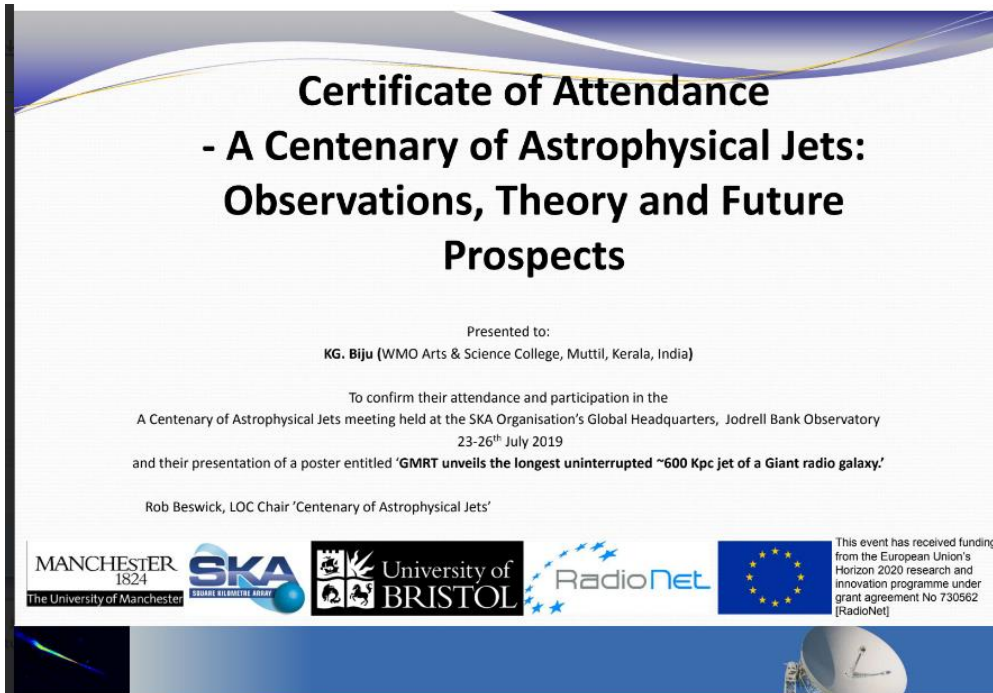


Discussion

- Based on the optical spectrum and mid-infrared colour, the AGN seems to be in ADAF (Advection-Dominated Accretion Flow) state (radiatively inefficient). In such systems, the accretion disk is geometrically thick and as a result, the energy will be liberated through jetted outflows. Thus large-scale jets can be launched from such systems.
- The jets from the second episode are advancing through the non-thermal medium (evacuated by the previous episode), which possibly helps it to grow to larger distances.



(b) Certificate



(c) Pictures.

