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Decadal report of RAD@home Citizen Science Research in Indian Radio Astronomy

Ananda Hota[1,2], Pratik Dabhade [3,4,2], Chiranjib Konar[5,2], Sabyasachi Pal[6,2], Sravani Vaddi[2], Prasun Machado[2], Joydeep Das[2], Sagar Sethi[2], Sumanta Sahoo[2], Shilpa Dubal[2], Sai Arun Dharmik Bhoga[2], P K Navaneeth[2], Apoorva Prakash[2], G. B. Raghavkrishna[2], Arundhati Purohit[2]
(1) UM-DAE Centre for Excellence in Basic Sciences, University of Mumbai, Mumbai, India, 400098, e-mail: hotaananda@gmail.com
(2) RAD@home Astronomy Collaboratory, Kharghar, Navi Mumbai, India, 410210, e-mail:radathomeindia@gmail.com
(3) Instituto de Astrofísica de Canarias, Calle Vía Láctea, s/n, E-38205, La Laguna, Tenerife, Spain
(4) Universidad de La Laguna (ULL), Departamento de Astrofisica, La Laguna, Tenerife, Spain
(5) Amity Institute of Applied Sciences, Amity University Uttar Pradesh, Noida-201303, India
(6) Midnapore City College, Kuturia, Bhadutala, Paschim Medinipur, West Bengal-721129, India

The RAD@home Astronomy Collaboratory (#RADatHomeIndia), launched on 15th April 2013, is based on an innovative citizen science research model that has made extragalactic radio astronomy accessible to undergraduate students across Indian universities. Over the past decade, RAD@home has hosted Discovery Camps (week-long) and workshops (one-day events) at over two dozen Indian institutes. These events, coupled with active social media engagement (weekly Live events and 24x7 postings and commentings), have enabled thousands of students to participate in multi-wavelength (UV-optical-IR-radio) RGB-Contour image analysis. This approach has led to numerous preliminary discoveries by trained citizen scientists, which were followed with the GMRT for detailed investigation under the GOOD-RAC project and published internationally [1, 2]. In this talk, we will discuss the journey from inception to the success of this first Indian citizen science research collaboratory in astronomy and showcase its key discoveries, which include giant relic radio lobes, episodic radio galaxies, collimated synchrotron threads, radio rings or odd radio circles, quasar ionisation echos with radio jets, strange cases of AGN-feedback as jet-galaxy interactions, radio jet-burls, giant radio spirals, giant radio bubbles in merging galaxies etc. These new radio continuum features extend beyond the standard components of radio galaxies and quasars, pushing us to rethink AGN-jet-feedback in the broader context of galaxy black hole coevolution. Our unique model not only advances scientific knowledge but also prepares the next generation for research with upgraded facilities like the GMRT and the forthcoming Square Kilometre Array Observatory (SKAO).

1. A. Hota, C. Konar, C.S. Stalin, S. Vaddi, P.K. Mohanty, P. Dabhade, S.A. Dharmik Bhoga, M. Rajoria, S. Sethi, “Tracking Galaxy Evolution Through Low-Frequency Radio Continuum Observations using SKA and Citizen-Science Research using Multi-Wavelength Data,” Journal of Astrophysics and Astronomy 37, 4, December 2016, pp 41, DOI:10.1007/s12036-016-9415-8

2. A. Hota, P. Dabhade, S. Vaddi, C. Konar, S. Pal, M. Gulati, C.S. Stalin, C. Avinash, A. Kumar, M. Rajoria, A. Purohit,“RAD@home citizen science discovery of an active galactic nucleus spewing a large unipolar radio bubble on to its merging companion galaxy,” Monthly Notices of the Royal Astronomical Society: Letters, 517, 1, November 2022, pp L86–L91, DOI:10.1093/mnrasl/slac116