

# Dr. Abhirup Datta

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&  
Center for Astrophysics and Space Astronomy,  
University of Colorado Boulder UCB 389, Boulder, CO-80309

## EDUCATION

- University of Calcutta, India                      Physics, BSc (Hon.)                      2002
- University of Pune, India                      Physics, MSc                      2004
- New Mexico Tech/NRAO, USA                      Physics (Astrophysics), PhD                      2010

## APPOINTMENTS

2015-present      Assistant Professor, Center of Astronomy, IIT-Indore, India.  
2013- 2015      Research Associate at University of Colorado, Boulder, USA  
2011-2013      NASA Post-Doctoral Fellow at University of Colorado, Boulder, USA  
2007- 2010      Pre-Doctoral Fellow at NRAO, Socorro, USA  
2004-2007      Teaching Assistant at New Mexico Tech, Socorro, USA

## RESEARCH INTERESTS

Study of early universe through HI 21cm emission (Epoch Of Reionization), Studying Cosmic Dawn and Dark Ages through the global HI 21cm signal, HI 21cm absorption at high redshifts, Radio and X-ray Observations of Galaxy Clusters, Aperture synthesis calibration and imaging techniques, Ionospheric effects on low frequency radio interferometric calibration and imaging, Ionospheric effect on ground-based total power experiments & radio interferometers at low radio-frequencies, Space Weather, Sustainable Research and Big Data.

## TEACHING EXPERIENCE

Physics 122: Fall- 2004, 2005, 2006 & Spring- 2005, 2006, 2010. [Freshman Physics]  
PH-613 (Quantum Mechanics and Statistical Mechanics): Autumn-2015, 2016;  
PH-106 (Electromagnetics): Spring 2016.  
AA-472/672 (Extragalactic Astronomy): Spring 2016, 2017;  
AA-474/674 (Radio Astronomy): Spring 2016, 2017  
AA-698 (PhD Seminar Course): Spring 2017  
Designed and developed the M.Sc Astronomy curriculum in IIT Indore (along with other colleagues).

## TECHNICAL SKILLS

- Programming in FORTRAN, C, Python, Matlab, R, and IDL.
- Expertise in Astronomical Image Processing System (AIPS) and Common Astronomy Software
- Applications (CASA) to analyze radio astronomical data. Working knowledge of Miriad.
- Expertise in Chandra Interactive Analysis of Observations (CIAO) software and Scientific Analysis System (SAS) - XMM Newton data analysis software, XSPEC -An X-Ray Spectral Fitting Package.
- Good exposure to observing and functional aspects of radio interferometers like the Giant Meterwave Radio Telescope (GMRT), Australia Telescope Compact Array (ATCA) and the Jansky Very Large Array (JVLA).
- Observing experience with single dish radio telescopes: the GreenBank Telescope (GBT) and the Parkes Telescope.
- Involved in testing and analysis of observations from the ground based engineering prototype of Dark Ages Radio Explorer (DARE).
- Involved in design aspects of Square Kilometer Array (SKA) with respect to the requirements from the CD/EoR (Cosmic Dawn/Epoch of Reionization) Key Science Project.
- Exposure to Ionospheric Research and Space Weather with Indian Regional Navigation Satellite System (IRNSS) and GNSS.

## FELLOWSHIPS, AWARDS and MEMBERSHIPS

- NASA Post-Doctoral Fellowship, 2011
- NRAO Pre-doctoral Fellowship/Graduate Internship, 2009
- Qualified at the Lectureship Level in CSIR-UGC National Eligibility Test, 2003.
- Recipient of Certificate of Merit, National Scholarships Scheme, 1997 and 1999.
- Member of American Astronomical Society (AAS) since 2008
- Member of Society of Physics Students (SPS) since 2006
- Visiting Associate at IUCAA, Pune, India since July, 2016

## PUBLICATIONS

1. **Datta, A.**, Burns, J.O., et al. “Effects of Ionosphere on the Ground-Based Detection of Global 21CM Signal from The Cosmic Dawn”, ApJ in press . ArXiv 1409.0513 [Impact Factor – 6.28]
2. Kale, R. et al. including **A. Datta**, “Clusters of galaxies and the cosmic web with SKA”, 2016, JoAA, In Press
3. Datta, K.K. et al. including **A. Datta**, “Probing individual sources during reionization and cosmic dawn using SKA HI 21-cm observations”, 2016, JoAA, In Press
4. Majumdar, S. et al. including **A. Datta**,” Line of sight anisotropies in the Cosmic Dawn and EoR 21-cm power spectrum”, 2016, JoAA, In Press
5. Malu, S.S., **Datta, A.** and Sandhu, P., “First detection at 5.5 and 9 GHz of the radio relics in bullet cluster with ATCA”,2016, Ap&SS, 361, 1-8 [Impact Factor – 1.7]

6. **Datta, A.**, Schenck, D.E. , et al. “How Much Can We Learn From A Merging Cold Front Cluster? : Insights From X-ray Temperature And Radio Maps Of Abell 3667”, 2014, ApJ, 793, 80D [Impact Factor – 6.28]
7. Schenck, D.E., **Datta, A.**, et al. “X-ray Observations of Complex Temperature Structure in the Cool-core cluster Abell 85”, 2014, AJ, 148, 23S. [Impact Factor – 4.05]
8. Roy, N., **Datta, A.**, Momjian, E. and Sarma, A.P., “Imaging of the CCS 22.3 GHz Emission in the Taurus Molecular Cloud Complex”, 2011, ApJ, 739L, 4R [Impact Factor – 6.28]
9. Dymond, K. et al. including **Datta, A.**, “A medium-scale travelling ionospheric disturbance observed from the ground and from space”, 2011, Rad. Sci., 46, RS5010 [Impact Factor – 1.45]
10. Schinnerer, E., Sargent, M., Bondi, M., Smolcic, V, **Datta, A.**, et al., “The VLA-COSMOS Survey. IV. Deep Data and Joint Catalog”, 2010, ApJS, 188, 384S [Impact Factor – 14.137]
11. **Datta, A.**, Bowman, J.D. and Carilli, C.L.,”Bright Source Subtraction Requirements for Redshifted 21 cm Measurements”, 2010, ApJ, 724,526D [Impact Factor – 6.28]
12. **Datta, A.**, Bhatnagar, S. and Carilli, C.L., “Detection of Signals from Cosmic Reionization Using Radio Interferometric Signal Processing”, 2009, ApJ, 703, 2, 1851-1862 [Impact Factor – 6.28]
13. Carilli, C.L. et al. including **Datta, A.**, “Star Formation Rates in Lyman Break Galaxies: Radio Stacking of LBGs in the COSMOS Field and the Sub- $\mu$ Jy Radio Source Population”, 2008, ApJ, 689, 2, 883-888 [Impact Factor – 6.28]

## TECHNICAL REPORTS

1. **Datta, A.** and Ananthakrishnan, S., “A Report on Behavior of Total Electron Content over candidate Sites for SKA location”, 2006, ISSAC Report (SPDO ref.1)
2. **Datta, A.** and Nityananda, R., “Radio Holography of GMRT Dishes”, 2004, NCRA Technical Report.

## CONFERENCE PROCEEDINGS

1. Burns, J.O., **Datta, A.** and Hallman, E. , “Big Bangs in Galaxy Clusters: Using X-ray Temperature Maps to Trace Merger Histories in Clusters with Radio Halos/Relics”, June, 2016, AAS, 22811002B
2. Burns, J.O., et al. including **Datta, A.**, “Extracting Physical Parameters for the First Galaxies from the Cosmic Dawn Global 21-cm Spectrum”, January, 2016, AAS,22730704B
3. Burns, J.O., et al. including **Datta, A.**, “Investigations of the First Objects to Light Up the Universe: The Dark Ages Radio Explorer (DARE) Mission Concept”, August, 2015, IAU General Assembly, 2229646B
4. Genova, A.L. et al including **Datta, A.**, “Trajectory Design From GTO To Lunar Equatorial Orbit For The Dark Ages Radio Explorer (DARE) Spacecraft”, Proceedings of AAS/AIAA Space Flight Mechanics Meeting, Williamsburg, VA, Jan 11-15, 2015
5. Burns, J.O., et al. including **Datta, A.**, “From Darkness to Light: Observing the First Stars and Galaxies with the Redshifted 21-cm Line using the Dark Ages Radio Explorer”, January, 2015, AAS, 22531807B

6. **Datta, A.** et al. , “An Engineering Prototype For The DARE (Dark Ages Radio Explorer)”, Talk at USNC-URSI National Radio Science Meeting, January ,2014.
7. Burns, J.O., Harker, G.A., Mirocha, J. and **Datta, A.**, “Challenges of Measuring Cosmic Dawn with the 21-cm Sky-Averaged, Global Signal”, January, 2014, AAS, 22324501B.
8. Paul, S., **Datta, A.** and Intema, H.T., “Tracing the merger history of MACS clusters using the GMRT”, 2014, BASI proceedings, Meter Wave Sky Conference, Pune, India.
9. **Datta, A.**, “Exploring the Dark Ages and Epoch of Reionization with the HI 21cm signal”, Journal of Phys.: Conf. Ser., COSGRAV12, 405, 012012
10. **Datta, A.** et al., “Dark Ages Radio Explorer- Field Tests of a Prototype Instrument”, 2012, AAS, 2201302D.
11. Roy, N., **Datta, A.**, Momjian, E. and Sarma, A.P. , “EVLA Observations of Thioxoethenylidene In the Taurus Molecular Cloud Complex”, 2012, AAS, 22042322RR.
12. **Datta, A.** et al., “Dark Ages Radio Explorer Instrument Verification Program: Antenna Test Results”, 2012, AAS, 21924120D.
13. **Datta, A.**, Carilli, C.L., Bhatnagar, S. and Bowman, J.D., “Searching for Cosmic Reionization with the HI 21 cm Signal”,2010, AAS, 21532502D
14. Watts, C. et al. including **Datta, A.**, “ A Medium-Scale Traveling Ionospheric Disturbance Observed from the Ground and from Space”, 2008, AGU, 2008, SA33A-1623
15. Dymond, K. et al. including **Datta, A.**, “ The Combined Radio Interferometry and COSMIC Experiment in Tomography (CRICKET) Campaign”, 2008, COSPAR, 775
16. Backer et al. including **Datta, A.**, “ PAPER: The Precision Array To Probe The Epoch Of Reionization” 2007, AAS, 211, 133.02; BAAS, 39, 967

## CONFERENCE PRESENTATIONS

1. “Global 21cm Observations - current status and future directions”, Talk given at Workshop on Epoch of Reionization, IIT-KGP, India, July, 2016
2. “Foreground Challenges for 21cm Cosmology Observations - Current Status”, Talk given at Workshop on Epoch of Reionization, IIT-KGP, India, July, 2016
3. “The Dark Ages Radio Explorer (DARE) “, Invited Talk given at CMB Spectral Distortions Conference, RRI, Bangalore, July, 2016
4. “Foreground Challenges”, Invited Talk given at Science with Science with the uGMRT workshop at NCRA, Pune, June, 2016.
5. “21cm Cosmology-Search for global signal from Cosmic Dawn/EoR”, Talk given at Cosmic Reionization Workshop, Munich Institute of Astro- and Particle Physics, Munich, Germany, April, 2016.
6. “Impact of Earth’s Ionosphere on High Precision Radio Astronomy Observations”, Invited Talk given at 6<sup>th</sup> International Conference on Computers and Devices for Communication, Kolkata, India, December, 2015.
7. “Search for Global 21cm Signal from the Dark Ages”, Talk given at International Conference on Gravitation and Cosmology, IISER Mohali, December, 2015.

8. "Understanding Merger Activities in Galaxy Clusters Using High Fidelity X-ray Temperature Maps and Radio Observations", Poster presentation at Snowclusters Conference, Utah, USA, March, 2015.
9. "The Dark Ages Radio Explorer (DARE) ", Talk given at Meter Wave Sky Conference, December, 2013, Pune, India.
10. "The Dark Ages Radio Explorer (DARE) from the Moon: An Update on the Instrument Verification Program." Talk given at the Lunar Science Forum, July, 2013.
11. "The Dark Ages Radio Explorer (DARE): Constraining Cosmic Dawn from the Global 21-cm Signal", Talk given at 'EoR Global Signal Workshop', November 2012, CAASTRO, Sydney, Australia.
12. "Dark Ages Radio Explorer - Field Tests of a Prototype Instrument" Poster presented at the Lunar Science Forum, July 2012, NASA Ames Research Center, USA.
13. "Exploring the Dark Ages and Epoch of Reionization with the HI 21cm signal", Talk given at 'International Conference on Modern Perspectives of Cosmology and Gravitation', February 2012, Kolkata, India.
14. "Initial Results from DARE Antenna Tests", Poster presented at the Lunar Science Forum, July 2011, NASA Ames Research Center, USA
15. "Bright Foreground Removal Requirements for EoR Experiments", Talk given at 'Understanding Galactic and Extragalactic Foregrounds' Conference, May 2011, Zadar, Croatia.
16. "Effects of low frequency calibration errors on the detection of EOR", Talk given at SKA Calibration and Imaging Workshop, April 2009, Socorro, USA
17. "Detection Of Cosmic Stromgren Sphere", Talk given at SKA Calibration and Imaging Workshop, April 2008, Perth, Australia.
18. "VLA-COSMOS Survey - an update", Poster presented at Deep Surveys of the Radio Universe with SKA Pathfinders Meeting, April 2008, Perth, Australia.
19. "Investigating Ionospheric Corruptions in Imaging", Talk at Radio Surveys: Science and Techniques Meeting, April, 2007, IAS, Los Alamos, USA

## OTHER PUBLICATIONS

1. Datta, C.R., **Datta, A.**, et al., "A Novel Approach in Power Control Scheme for WCDMA Systems using Bit Delay", accepted for publication at IEEE Conference CODEC, 2015
2. Datta, C.R., **Datta, A.**, et al., "Monte Caro Analysis to Estimate the Performance of Adaptive Power Control Algorithm for Varying Target SIR", 2012, IEEE Conference - CODIS, 325.
3. Datta, C.R., **Datta, A.**, et al., " Performance analysis of Adaptive Power Control Algorithm for Varying Target SIR", 2012, IEEE Conference - CODEC , RSS-L1
4. Joardar, S., **Datta, A.**, et al., "A proposal for economical design of a computer automated VHF spectrograph for universities and study centers", IETE Journal of Research, 2007, 53, 83.

## PROFESSIONAL ACTIVITIES

- Scientific Referee for The Astrophysical Journal (ApJ), The Astrophysical Journal Supplement Series (ApJSS), Proceedings of the Astronomical Society of the Pacific (PASP).
- Co-Advisor to Undergraduate Student at University of Colorado, Boulder, USA.
- Co-Investigator on a proposal “The Biggest Bangs Since the Big Bang: Unveiling Mergers of Galaxy Clusters with Radio Halos/Relics Using X-ray Temperature Maps” funded by NASA Astrophysics Data Analysis Program, May, 2014.
- Co-Investigator on a proposal “Dark Ages Radio Explorer” submitted to NASA as a SMEX mission on December 18, 2014.
- Science Team Member and Collaborator on a proposal “Dark Ages Radio Explorer” submitted to NASA as an Explorer mission on December 16, 2016.
- Focal person for MoU between IIT Indore and ISRO-SAC regarding two IRNSS receivers that will be installed in IIT Indore at Centre of Astronomy.
- Member from India in the Square Kilometer Array (SKA) CD/EoR Science Team Board since January, 2017.