

Curriculum Vitae

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Qualifications:

BOARD/UNIVERSITY	GRADES	YEAR
Higher School Certificate Cambridge Board	Physics A Maths A Chemistry A	Dec 1984
BSc. (Hon.) Physics Delhi University	1st Division	Jun 1988
MSc Physics Delhi University	1st Division	Jun 1990
Ph.D Physics University of Mauritius	*	1998

*Thesis: Synthesis Imaging at 151.5 MHz using the Mauritius Radio Telescope.

Thesis Supervisors: Prof. N. UdayaShankar and Prof Ch. V. Sastry

Ph.D Thesis abstract:

The Mauritius Radio Telescope (MRT) is an instrument which has been designed to make a survey, of the southern sky, at a resolution of $4' \times 4' \sec(\delta - \phi)$ and a sensitivity of 70 mJy (1σ). The aim of this instrument is to fill in the lacuna in

observations that exists, at metric wavelengths, for this region of the sky.

The design criteria and modifications while implementing the design are discussed in this thesis.

The calibration technique of the visibilities obtained from the MRT is described here. The use of celestial objects to estimate errors in the geometry of the array is also presented.

The basis for transit mode imaging large fields of view with non-planar arrays is discussed. The shape of the the resulting Point Spread Function (PSF) is derived. From this a technique to generate PSF's at all declinations for the MRT is presented. The basic information for estimating the PSF is extracted from the dirty image itself as this gives a better S/N ratio.

We present deconvolved images generated from MRT data, at a resolution of $13' \times 17' \sec(\delta - \phi)$.

From these images a source list is extracted. This list is used to confirm the primary beam of the helical antenna used in the array and to confirm the accuracy of the technique used in the system. We present a few comparisons with other surveys available in the southern declinations.

Positions held:

- Research Assistant, University of Mauritius (Sep 1990 - Jun 1994)
- Research Officer, University of Mauritius (Jul 1994 - Mar 2001)
- Head, Mauritius Radio Telescope (Jan 1997 - Dec 1997)
- Post Doctoral Fellow at the NRAO, with the AIPS++ group (Apr 1999 - Apr 2001)
- Assistant Scientist, AIPS++, NRAO (Apr 2001 - Jun 2004)
- Deputy Project Manager, CASA, (Dec 2002 - Sep 2008)
- Associate Scientist, CASA, NRAO (Jul 2004 - Dec 2010)
- Scientist, CASA, NRAO (Jan 2011 - present)

Experience:

- Teaching of different modules of BSc Physics at the University of Mauritius
- Worked on modeling the behaviour of solar corona at low frequencies. This included application of ray tracing techniques to anisotropic plasma in the presence of scattering objects.

- R.F and analogue electronics: Involved in designing, testing, modifying the R.F. part of the Mauritius Radio Telescope from the helical antennas to the second I.F. in the receiver room.
- Digital electronics: Participated in testing the correlator from the Clark Lake Radio Observatory which was subsequently adapted for use at the MRT. Worked on interfacing the correlator with PC's. Have been playing a major role in the maintenance of the MRT array and receiver while most of the data for the MRT survey have been collected.
- Contributed in the development of techniques to calibrate and image with the non-planar MRT array. Developed a technique to generate the PSF at every point on a wide field image so as to deconvolve images made from the MRT. Part of my Ph.D thesis is devoted to this problem of wide field imaging with a non-planar array. Contributed in programs which are used for calibrating, imaging, beam shifting and point source detection (mostly in C).
- Has been working with the CASA group at the NRAO, Socorro on the implementation of imaging algorithms and their parallelization. In the process, has learnt C++, glish script language, python, openmp and MPI standard and has a lot of experience on working on a large Object Oriented Project (2 million lines of code).
- Has been working on general synthesis imaging development and code maintenance in CASA/AIPS++ since April 2000. This work includes:
 - (i) Parallelization of wide-field facet imaging using MPI
 - (ii) Code profiling and optimization
 - (iii) Single dish imaging
 - (iv) Proved and developed and implemented the "On The Fly interferometric" mosaic code
 - (v) Developed automatic frames conversion while imaging (including spectral frame thus bypassing need for explicit uv data frame change)
 - (vi) Implemented Heterogenous Array and frequency varying beams mosaicking
 - (vii) Developed generic algorithm for Direction Dependent correction and implemented W-Projection and mosaicking corrections
 - (viii) Worked on implementation of different techniques for interferometer and single dish data
 - (ix) Optimized and parallelized different imaging gridders/degridders (including the DFT or ComponentModel degridding) using openmp for multithreading
 - (x) Development of a working prototype of cluster based imaging. Proved that both continuum and cube imaging show significant speedups while using a beowulf style clusters with the required data distribution.

- CASA (formerly AIPS++) deputy project manager from Dec 2002 to Sept 2008
- Computer related languages:
 - (i) Assembly Language for 80x86 microprocessors
 - (ii) Python, Glish, Octave
 - (iii) Fortran
 - (iv) C
 - (v) C++
 - (vi) OpenCL for multi-threading and GPU programming
 - (vii) openmp (for multi-threading)
 - (viii) MPI (for multiprocessing)
- Operating Systems:
 - (i) DOS, used for acquisition of data
 - (ii) Linux/Unix

Research Interests:

- Low Radio Frequency data reduction
- Supernova Remnants
- Large scale structure imaging (including Single dish and mosaicking)
- High performance computing applied to radio astronomy

Award:

NRAO Star Award September 2007

Publications and Posters:

1. The Radio brightness of the Undisturbed solar corona in the presence of a radial magnetic field, Kumar Golap and Ch.V.Sastry, Solar Physics, 150, 295-304, 1994.
2. A calibration Scheme for the Mauritius Radio Telescope, K. Golap, R. Dodson and N Udaya Shankar, Bull. Astron. Soc. of India, 23, 574, 1995
3. The Mauritius Radio Telescope, K. Golap, N. Issur, R. Somanah, R. Dodson, M. Modgekar, S. Sachdev, N. Udaya Shankar and Ch. V. Sastry, Astrophys. Sp. Sci, 228, 373, 1995
4. A low frequency radio telescope at Mauritius for a Southern sky survey, K. Golap, N. Udaya Shankar, S. Sachdev, R. Dodson and Ch. V. Sastry, J. Astrophys. Astr., 19, 35-53, 1998

5. On the association of G343.1-2.3 and PSR 1706-44, R. Dodson, K. Golap, J.L. Osborne, N Udayashankar, The Universe at Low Radio Frequencies, Proceedings of IAU Symposium 199, held 30 Nov - 4 Dec 1999, Pune, India. Edited by A. Pramesh Rao, G. Swarup, and Gopal-Krishna, 2002., p.299
6. Wide Field Imaging in AIPS++, K. Golap and T.J. Cornwell, Poster AAS 1999.
7. Radio Wave Scattering in the Solar Wind, Desai, K. M.; Golap, K.; Anantharamaiah, K. R., Poster, American Astronomical Society Meeting 197, #128.01
8. Parallelization of Widefield Imaging in AIPS++, Golap, K., Kemball, A.; Cornwell, T.; Young, W. Astronomical Data Analysis Software and Systems X, ASP Conference Proceedings, Vol. 238, p.408, 2000
9. Parallelization of Widefield Imaging in AIPS++, Golap, K., Kemball, A.; Cornwell, T.; Young, W., Trends in Optics and Photonics Series, Vol. 66, 2001
10. Deconvolution of Wide-field Images from a Non-Coplanar T-Array, Golap, K.; Shankar, N. Udaya, Journal of Astrophysics and Astronomy, Vol. 22, p. 213-228, 2001
11. On the association of G343.1-2.3 and PSR B1706-44, Dodson, R.; Golap, K., Monthly Notices of the Royal Astronomical Society, Volume 334, Issue 1, pp. L1-L5, 2002
12. PKS B1400-33: an unusual radio relic in a poor cluster, R. Subrahmanyan, A. J. Beasley, W. M. Goss, K. Golap, R. W. Hunstead, The Astronomical Journal, Volume 125, Issue 3, pp. 1095-1106, 2003
13. New High-Resolution Radio Observations of the Supernova Remnant CTB 80, G. Castelletti, G. Dubner, K. Golap, W. Goss, P. Velzquez, M. Holdaway, A.P. Rao, The Astronomical Journal, Volume 126, Issue 5, pp. 2114-2124, 2003
14. A Spectral Analysis of the Central Component of CTB 80, G. Castelletti, G. Dubner, K. Golap, W. Goss, Young Neutron Stars and their Environment, International Astronomical Union. Symposium no. 218, 14-17 July, 2003
15. The AIPS++ Project, J.P. McMullin, K. Golap, S.T. Myers, ADASS XIII, ASP Conference Proceedings, Vol. 314. San Francisco: Astronomical Society of the Pacific, 2004., p.468
16. Post Correlation RFI excision, K. Golap, T. Cornwell, R. Perley, S. Bhatnagar, From Clark Lake to the Long Wavelength Array, ASP Conf. Series, Vol 345, 2005., p.366

17. W Projection: A New Algorithm for Wide Field Imaging with Radio Synthesis Arrays, T.J. Cornwell, K. Golap, S. Bhatnagar, *Astronomical Data Analysis Software and Systems XIV ASP Conference Series*, Vol. 347, Ed. P. Shopbell, M. Britton, *Astronomical Society of the Pacific*, 2005., p.86
18. Mosaicing with interferometers: An Efficient Algorithm for Imaging and Image Plane Corrections, S. Bhatnagar, K. Golap, T.J. Cornwell, *Astronomical Data Analysis Software and Systems XIV ASP Conference Series*, Vol. 347, Ed. P. Shopbell, M. Britton, *Astronomical Society of the Pacific*, 2005., p.96
19. A High-resolution Polarimetric Survey of the Central 200 pc of the Galaxy, T.M. Freismuth, C.C. Lang, T.J. Lazio, K. Golap, 2007 AAS/AAPT Joint Meeting, *American Astronomical Society Meeting 209, #172.16*; *Bulletin of the American Astronomical Society*, Vol. 38, p.1149
20. New VLA observations of the SNR Puppis A: the radio properties and the correlation with the X-ray emission, G. Castelletti, G. Dubner, K. Golap, W.M. Goss, *A&A*, Vol 459, 2006, pp.535-544
21. CASA Architecture and Applications, J.P. McMullin, B. Waters, D. Schiebel, W. Young, K. Golap, *Astronomical Data Analysis Software and Systems XIV ASP Conference Series*, Vol. 76, Ed. R. Shaw, F. Hill, D.J. Bell, *Astronomical Society of the Pacific*, 2007., p.127
22. Correcting direction-dependent gains in the deconvolution of radio interferometric images, S. Bhatnagar, T.J. Cornwell, K. Golap, J. M. Uson, *Astronomy and Astrophysics*, Volume 487, Issue 1, 2008, pp.419-429
23. The Noncoplanar Baselines Effect in Radio Interferometry: The W-Projection Algorithm, T.J. Cornwell, K. Golap, S. Bhatnagar, *IEEE Journal of Selected Topics in Signal Processing*, Vol. 2, No. 5, October 2008, pp.647-657
24. Wide-field wide-band Interferometric Imaging: The WB A-Projection and Hybrid Algorithms, S. Bhatnagar, U. Rau, K. Golap, *The Astrophysical Journal*, Volume 770, Issue 2, article id. 91, 2013
25. Instrumental Direction-dependent Effects in Wide-field Wide-band Interferometric Imaging, S. Bhatnagar, U. Rau, K. Golap, *Proceedings of the conference held 30 March - 4 April, 2014 in Monterey, California*. *Bulletin of the American Astronomical Society*, Vol. 46, #3, #402.01
26. Multithreading Gridders Without Copying and Locks, K. Golap, *EVLA memo 191*, Jan 2015.

27. The 2014 ALMA Long Baseline Campaign: An Overview, ALMA partnership, The Astrophysical Journal Letters, Volume 808, Issue 1, article id. L1, 11 pp., 2015
28. Highest Redshift Image of Neutral Hydrogen in Emission: A CHILES Detection of a Starbursting Galaxy at $z = 0.376$, Fernandez et al., The Astrophysical Journal Letters, Volume 824, Issue 1, article id. L1, 7 pp., 2016
29. MSUVBIN: A Way to Combine, Average, Flag Visibility Data, K. Golap, E. Momjian, EVLA memo 198, July 2016.