



**NATIONAL RESEARCH
FOUNDATION
SOUTH AFRICA**

**APPLICATION FOR A JOINT RESEARCH GRANT UNDER THE SA/POLAND AGREEMENT
ON COOPERATION IN SCIENCE AND TECHNOLOGY**

PART I: GENERAL INFORMATION

Title of Joint Activity: 'The dynamics high-mass star formation regions as revealed by methanol masers'	
Activity Start Date :January 2009	Activity End Date: December 2010
Discipline:	

	2009	2010	TOTAL
Overall Budget Distribution ZAR:SA South Africa + Poland	103800 148800	111400 285400	215200 434200

Names, Addresses and Affiliations of Principal Investigators

	South Africa	Poland
Full name:	Roy Sims Booth	Andrzej Kus
Title:	Professor, Director	Professor, Director
University/Institution:	Hartebeesthoek Radio Astronomy Observatory, (HartRAO)	Nicolaus Copernicus University Torun Centre for Astronomy
Dept./Faculty:		Radio Astronomy
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E-mail:	roy@hartrao.ac.za	"Andrzej Kus" <ajk@astro.uni.torun.pl>
Race (SA only)	British	Polish
Gender (SA only)	Male	Male
ID No	UK Passport no. 705146303	


SUMMARY OF JOINT RESEARCH


A brief abstract should be written in the space below, describing the work of both partners (Polish and South African) in such a way as to be comprehensible to a non-specialist in the research field. Applications should briefly describe: **1. Objectives; 2. Methodology; 3. Significance of the proposed research; 4. Mode of co-operation; 5. Anticipated outputs; 6. Scientific and technological background and 7. Possible socioeconomic benefits.** (Extend space where required)


Names and affiliations of other South African researchers/students to participate in the project (add rows where required)


Full name	Current Academic Qualification	Institution	Race & Gender
Sharmila Goedhart	PhD	HartRAO	
Michael Gaylard	PhD	HartRAO	
Johan van der Walt	PhD	Univ North West	
PhD student to be appointed			

Signatures (All copies submitted should contain the original signature of the submitting Principal Investigator, that of his/her Head of Department as well as the Research Authorising Officer of his/her institution.

Principal Investigator Name: Roy Booth	
Position: Director	
Signature: 	Date: 2008-06-19

Department Head Name: Roy Booth	
Signature: 	Date: 2008-06-19

Research Authorising Officer Name:	
Signature: 	Date: 2008-06-19

Polish Partner's Name: Andrzej Kus	
Position: Director	Date: 2008-06-19
Signature: 	

PART II - DETAILED DESCRIPTION OF THE PROJECT

A full technical project description should be included here or submitted on separate pages.

The following are suggested headings for this section:

1. Detailed description of the project.
2. Discussion of the scientific and technological background (including references and the relationship to previous research activities relating to the present proposal).
3. Specific objectives and expected significance of the research project.
4. Methodology and plan of work. The respective roles of the co-operating partners in carrying out the proposed research plan should be indicated.
5. Record of preliminary results relevant to the proposals .
Detailed account of available resources including all personnel and equipment.
6. Mode of co-operation between the Polish and South African research teams.
7. Bibliography relevant to the research area.
8. Possible socioeconomic benefits to the country.

Note: Items 1 to 8 should be limited to a maximum of 5 pages.

PART III - TIME SCHEDULE AND WORK PLAN

Please outline the activities planned by the Polish and South African investigators for the total period of the project (extend space where required)

Research Activity	Location of Research Activity		Proposed Duration			
	Institution	Country	Start		End	
			Month	Year	Month	Year
2009 2 teleconferences planning observations and discussing source list	Both observatories		Jan	2009		
Single dish observations of sources at 6.7 and 12.2 GHz ⁱ			Feb	2009	Dec	2009
Polish student or postdoc to SA			June	2009	Sept	2009
SA Team to Poland			Sept	2009		
Teleconference to choose VLBI candidates and write EVN proposal ²			Oct	2009		
2010	EVN				Oct	2010
Monitoring continues			Jan	2010	Feb	2010
VLBI Observations scheduled ³			Feb	2010	July	2010
SA Student to Poland and JIVE ⁴			April	2010		
Polish team to SA Discussion of VLBI results Decision on publications/conferences (EVN)			Sept	2010		
Presentation at EVN conference ⁵	Sept	2010				

PART IV - BUDGET DESCRIPTION**Instructions:**

Separate budgets should be prepared for the Polish and South African sides of the project.

1. BUDGET DETAILS FOR SOUTH AFRICAN FUNDING (in Rand)

Travel, accommodation and subsistence allowance (add rows where required)

Description	1 st Year	2 nd Year
Visit to Poland (Sept) 3 SA researchers: 10 days		
Airfare (SA researchers): 3 x 15000 (incl taxis etc)	45000	
SA student to Poland (Airfare)		15000
Accommodation (Polish researchers)		
Polish student/postdoc in SA 3 months Part accommodation at observatory (6 weeks):	1800	
6 weeks B&B @ 500/ DAY	21000	
Accommodation: 3 Polish researchers 10 days @ 600/day		18000
Subsistence (3 Polish researchers - 400 per day & 10 days Number of Days):		12000
Polish student in SA 90 days @ ZAR 400	36000	
3 x Polish researchers visit 10 days @ ZAR 500		15000
Other Transportation (Poland & SA) Car hire 10 days		3000
TOTAL	103800	63000

Costs for joint conferences and workshops (where applicable – add rows where required)

Item Description	Cost
2 South Africans to EVN symposium in Europe airfare and other travel	30000
2 x 6days subsistence in Europe@ ZAR 600	7200
2 x 6 days hotel @ ZAR 800	9600
2 x Conference fee @ ZAR 800	1600
TOTAL	48400

2. BUDGET FOR THE WHOLE PROJECT (POLISH AND SOUTH AFRICAN) IN RANDS**Polish Side (Guestimates – see Polish Proposal)**

	1 st Year	2 nd Year
Travel, accommodation and subsistence allowance:	45000	110,000
Conference/Workshop: 3 people to EVN conference		64000
Other (please specify):		
TOTAL	45000	174000

South African Side

	1 st Year	2 nd Year
Travel, accommodation and subsistence allowance:	103800	63000
Conference/Workshop:		48400
Other (please specify):		
TOTAL	103800	111400

3. OTHER SOURCES OF SUPPORT**3.1 Is this research currently being supported by other sources?**

	NO
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If yes, please indicate the sources, amounts and periods of support.

Polish side:

South African side:

3.2 Has this project been submitted to other agencies for financial support?

<input type="checkbox"/>	NO
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If yes, please indicate which agencies, and when.

Polish side:

South African side:

PART V - BIOGRAPHICAL AND PROFESSIONAL INFORMATION**1. Principal Investigator - Polish**

This resume concerns the Principal Polish Investigator whose name appears in Part 1.

Title	Professor
First Names	Andrzej Jan
Family Name	Kus
Nationality	Polish
Year of Birth	1944

Resume (Relevance of the researcher's professional background to the proposed research).

In 1979 I received one year research fellowship from the Manchester University, Nuffield Radio Astronomy Laboratories Jodrell Bank in England. There I started to work on VLBI and MERLIN observations. The experience was gained in fields of VLBI techniques, the image processing and in the OH spectroscopy. The close collaboration with Dr R.S.Booth, Dr P.N.Wilkinson, Dr R.Norris, Dr P.Diamond had proven to be very successful and continued later over many years.

In 1987-1989 I worked as visiting scientist at Onsala Space Observatory Chalmers Technical University in Sweden. In close collaboration with Professor Roy Booth I worked on VLBI at 3 and 1 mm wavelength, on VLBI studies of Compact Steep Spectrum Quasars and on the mm wave study of the Southern Sky radio sources using SEST. The further continuation of the work at the OSO was possible in 1991/1992 thanks to support received from the OSO and the Swedish Institute.

Several longer visits at the Max-Planck-Institut fur Radioastronomie in Bonn (1986, 1992, 1994) has led to a new collaboration with Prof. R.Wielebinski and his group - the study of Inter Stellar Matter (ISM) by means of complex VLBI observations of galactic and extra-galactic sources seen through the plane of the Galaxy. Also studies of radio sources in clusters of galaxies resulted from the co-operation.

Experience in fields of:

Radio astronomy techniques - especially radio interferometry, VLBI, mm VLBI, aperture synthesis, low noise receivers, antennas, extra galactic radio astronomy - physics of radio galaxies and quasars, spectroscopy of OH and methanol masers.

Teaching experience :

Lectures for undergraduates on : Extra Galactic Astronomy, Extra Galactic Radio Astronomy, Radio Astronomy, Astronomy and Astrophysics, tutorials in radio astronomy. Supervision of Ph.D. students (till now 7 Ph.D.'s successfully completed).

In addition, please enclose an abbreviated Curriculum Vitae, which should include the following:

1. Academic and professional training, including names of institutions, years of study, degrees and diplomas.
2. Academic and professional experience, including names of institutes and companies, role and period.
3. Research areas (detailed areas of research in which the researcher has been involved).
4. Publications and patents (during last two years).
5. Any additional detail which may assist in evaluating the professional background of the researcher.

2. Principal Investigator - South Africa

This resume concerns the Principal South African Investigator whose name appears in Part 1.

Title	Professor
First Names	Roy Sims
Family Name	BOOTH
Nationality	British
Year of Birth	1938

Resume (Relevance of the researcher's professional background to the proposed research).

My research interests from the time of my PhD from Jodrell Bank Observatory, the University of Manchester have always included cosmic masers, which were discovered the year before I commenced my PhD. My PhD was on interferometry of OH masers and I when I subsequently became a lecturer at Jodrell Bank in 1968 I started a maser research group studying OH masers in various environments – star formation, evolved stars and even Comets. We were able to make some ground breaking interferometric observations of OH masers associated with evolved stars and show that the OH maser cloud delineated a partial shell around the star.

During this period I spent a sabbatical year at the Max-Planck Institute for Radio Astronomy, in Bonn, Germany and made my first VLBI observations. This experience convinced me that Europe should have a VLBI network and I worked to start up such a collaboration among the European observatories, which has been very successful.

On leaving Jodrell Bank and taking up the Directorship of Onsala Space Observatory in Sweden, in 1982, I continued to study masers and formed a maser VLBI group with several staff and students. Among other things we made the first EVN observations of methanol masers and persuaded the EVN to adopt 6.7

In SA, I am also involved with the South African SKA project, MeerKAT and the observatory will operate the array in the future. It is imperative that we build up expertise in interferometry and the current project proposal will, I hope, bring a new student to Hartbeesthoek from where he will learn about masers and make interferometric observations as part of his Doctorate.

In addition, please enclose an abbreviated Curriculum Vitae, which should include the following:

1. Academic and professional training, including names of institutions, years of study, degrees and diplomas.
2. Academic and professional experience, including names of institutes and companies, role and period.
3. Research areas (detailed areas of research in which the researcher has been involved).
4. Publications and patents (during last two years).

5. Any additional detail which may assist in evaluating the professional background of the researcher.

PLEASE IDENTIFY THE NAMES OF AT LEAST FOUR PEER REVIEWERS:

NO	NAME	INSTITUTION	TEL & POSTAL ADDRESS	E-MAIL
1.	Professor P. J. Diamond	Univ Manchester, Jodrell Bank	+441612754214 Jodrell Bank Centre for Astrophysics, Alan Turing Building. The University, Manchester M139PL,UK	Philip.diamond@manchester.ac.uk
2.	Professor R.D. Davies	Univ. Manchester, Jodrell Bank	+441477572640 Jodrell Bank Observatory, Macclesfield, Cheshire, UK	Rod.davies@Manchester.ac.uk
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4.	Dr Anders Winnberg	Onsala Space Observatory	+46 31 772 5500 Onsala Space Observatory, SE 43992 Onsala, Sweden	Anders.winnberg@chalmers.se