



EUROPEAN SOUTHERN OBSERVATORY

Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

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APPLICATION FOR OBSERVING TIME

LARGE PROGRAMME

PERIOD: **79B**

Important Notice:

By submitting this proposal, the PI takes full responsibility for the content of the proposal, in particular with regard to the names of COIs and the agreement to act according to the ESO policy and regulations, should observing time be granted

1. Title

The VISTA Hemisphere Survey(VHS)

Category: **A-3**

2. Abstract / Total Time Requested

Total Amount of Time:

Total Number of Semesters:

We propose to carry out a panoramic Infra-Red survey, which when combined with other VISTA Public Surveys will result in coverage of the whole southern celestial hemisphere ($\sim 20,000\text{deg}^2$) to a depth ~ 4 magnitudes fainter than 2MASS/DENIS in at least two wavebands J and K. In the South Galactic Cap, $\sim 5000\text{deg}^2$ will be imaged deeper, including H band, and will have supplemental deep multiband grizY imaging data provided by the Dark Energy Survey (DES). The remainder of the high galactic latitude sky will be imaged in YJHK to be combined with ugriz wavebands from the VST ATLAS survey. The medium term scientific goals include: a huge expansion in our knowledge of the lowest-mass and nearest stars; deciphering the merger history our own Galaxy; measurement of large-scale structure out to $z \simeq 1$ and measuring the properties of Dark Energy; discovery of the first quasar with $z > 7$; In addition the survey will provide essential support for the ESA Cornerstone missions; XMM-Newton, Planck, Herschel and GAIA.

3. Run	Period	Instrument	Time	Month	Moon	Seeing	Sky Trans.	Obs.Mode
A	79	VIRCAM	256h	any	n	$\leq 1.4''$	THN	s
B	79	VIRCAM	55h	any	g	$\leq 1.4''$	THN	s
C	80	VIRCAM	256h	any	n	$\leq 1.4''$	THN	s
D	80	VIRCAM	55h	any	g	$\leq 1.4''$	THN	s
E	81	VIRCAM	256h	any	n	$\leq 1.4''$	THN	s
F	81	VIRCAM	55h	any	g	$\leq 1.4''$	THN	s
G	82	VIRCAM	256h	any	n	$\leq 1.4''$	THN	s
H	82	VIRCAM	55h	any	g	$\leq 1.4''$	THN	s
I	83	VIRCAM	256h	any	n	$\leq 1.4''$	THN	s
J	83	VIRCAM	55h	any	g	$\leq 1.4''$	THN	s
K	84	VIRCAM	256h	any	n	$\leq 1.4''$	THN	s
L	84	VIRCAM	55h	any	g	$\leq 1.4''$	THN	s

Following runs moved to box 3a, last page...

4. Principal Investigator: **R. McMahon** (Cambridge, UK, rgm@ast.cam.ac.uk)

Col(s): A. Lawrence (Edinburgh, UK), F. Castander (Barcelona, S), F. Abdalla (UCL, UK), D. Alexander (Durham, UK), J. Alfonso (IAC, S), C. Bailer-Jones (MPIA, D), M. Balcells (IAC, S), X. Barcons (Santander, S), D. Barrado y Navascues (Madrid, S), V. Belikov (Cam, UK), E. Bell (MPIA, D), N. Benitez (Granada, S), J. Bouvier (Grenoble, F), M. Bremer (Bristol, UK), S. Bridle (UCL, UK), L. Cairos (IAC, S), F. Carrera (Santander, S), E. Caux (Toulouse, F), M. Cioni (Edinburgh, UK), A. Collister (Cambridge, UK), R. Crittenden (Portsmouth, UK), G. Dalton (Oxford, UK), J. Davies (Cardiff, UK), P. Doel (UCL, UK), ...

5. Description of the proposed programme

A) Scientific Rationale: Scientific rationale: scientific background of the project, pertinent references; previous work plus justification for present proposal. **SEE SEPARATE SUBMISSION GIVEN IN ESO**

PUBLIC SURVEYS FORM

B) Immediate Objective: see Abstract and separate submission

C) Telescope Justification: There is no other IR imaging system that is capable of meeting the requirements of the proposed project.

D) Observing Mode Justification (visitor or service): VISTA is solely available in service mode

6. Experience of the applicants with telescopes, instruments and data reduction

The PI has wide experience of optical and near infra red imaging surveys. The team includes the VISTA PI(Emerson) and many other individuals that have been involved with the design of VISTA and the VISTA Data Flow System. The co-PI(Lawrence) is the PI of a sister project on UKIRT; UKIDSS. Our team is large as befits such an undertaking. We have a broad range of science experience from cosmology, weak lensing, large surveys, high-redshift quasars, galaxy properties to Galactic science. The VISTA PI, VISTA Project Scientist, and VISTA Camera Scientist, and the leaders of the VDFS Pipeline and Archive are co-Is and and so we have extensive experience with the technical issues for VISTA and its data handling. We are well equipped to deliver a high-quality science product and believe that the VHS survey will have lasting long-term value to the whole ESO, and indeed world, community.

7. Resources available to the team, such as: computing facilities, research assistants, etc.

Indicate below the strategy for data reduction and analysis with description of the available resources to the observing team, such as: computing capabilities, research assistants, etc...

8. Special remarks:

Take advantage of this box to provide any special remark (up to ten lines).

9. Justification of requested observing time and lunar phase

Lunar Phase Justification: We request grey time for Y abnd obsrevations. JHK can be obtained during any lunation provided the survey field is further than 30degrees from the moon.

Time Justification: (including seeing overhead) See Public Survey proposal

Calibration Request: Special Calibration - Adopt a special calibration
Convert to a normal programme? No

10. Report on the use of ESO facilities during the last 2 years

Report on the use of the ESO facilities during the last 2 years (4 observing periods). Describe the status of the data obtained and the scientific output generated.

11. Applicant's publications related to the subject of this application during the last 2 years

Emerson J.P. et al., 2004, "VISTA data flow system: overview", in Optimizing scientific return for astronomy through information technologies, eds. P.J. Quinn & A. Bridger, Proc. SPIE, vol. 5493, 401

Hambly N.C. et al., 2004, "VISTA data flow system: survey access and curation; the WFCAM science archive", in Optimizing scientific return for astronomy through information technologies, eds. P.J. Quinn & A. Bridger, Proc. SPIE, vol. 5493, 423

Irwin M.J. et al., 2004, "VISTA data flow system: pipeline processing from WFCAM and VISTA", in Optimizing scientific return for astronomy through information technologies, eds. P.J. Quinn & A. Bridger, Proc. SPIE, vol. 5493, 411

Hewett et al., 2006, MNRAS, 367, 454, "The UKIRT Infrared Deep Sky Survey ZYJHK Photometric System: Passbands and Synthetic Colours"

Lawrence et al., 2006, MNRAS, submitted, astro-ph/604426, "The UKIRT Infrared Deep Sky Survey(UKIDSS)"

Dye et al., 2006, MNRAS, accepted; astro-ph/0603608, "The UKIDSS Early Data Release"

12. List of targets proposed in this programme

Run	Target/Field	α (J2000)	δ (J2000)	ToT	Mag.	Diam.	Additional info	Reference star
AEIMQ	VHS-SGC-00	00 00 00	-30 00 00	899	18.0	180°	South Galactic Cap	
CGKOS	VHS-NGC-12	12 00 00	-30 00 00	899	18.0	180°	North Galactic Cap	
BFJNR	VHS-SGC-00	00 00 00	-30 00 00	273	18.0	180°	South Galactic Cap	
DHLPT	VHS-NGC-12	12 00 00	-30 00 00	273	18.0	180°	North Galactic Cap	
AEIMQ	VHS-GPS-00	00 00 00	-45 00 00	382	18.0	180°	Galactic Plane	
CGKOS	VHS-GPS-12	12 00 00	-45 00 00	382	18.0	180°	Galactic Plane	

Target Notes: The magnitude limit are defined in the K band. The VHS survey aims to cover the whole Southern sky when combined with other Public Surveys. We have divided the sky into 3 nominal regions. The Galactic Plane Survey(GPS); North Galactic Cap(NGS-12); South Galactic Cap(SGC-00). The galactic plane has been split into two and called VHS-GPS-00 and VHS-GPS-12. The South Galactic Caps is named VHS-SGC-00. The North Galactic Cap is named VHS-NGC-12. The numbers refer to the nominal mean RA. For simplicity, we have assumed that the NGC is only observable in the even periods and the SGC is only observable in odd periods. In principle more detail scheduling information could be provided. e.g. dividing sky into grid or assigning time for the NGC in the odd periods, etc. If this is needed, please contact us.

12b. ESO Archive - Are the data requested by this proposal in the ESO Archive (<http://archive.eso.org>)? If yes, explain why the need for new data.

Are the data requested in this proposal on the ESO Archive (<http://archive.eso.org>)? NO

13. Scheduling requirements

14. Instrument configuration

Period	Instrument	Run ID	Parameter	Value or list
79	VIRCAM	A	IMG	ZYJHK
79	VIRCAM	B	IMG	ZYJHK
80	VIRCAM	C	IMG	ZYJHK
80	VIRCAM	D	IMG	ZYJHK
81	VIRCAM	E	IMG	ZYJHK
81	VIRCAM	F	IMG	ZYJHK
82	VIRCAM	G	IMG	ZYJHK
82	VIRCAM	H	IMG	ZYJHK
83	VIRCAM	I	IMG	ZYJHK
83	VIRCAM	J	IMG	ZYJHK
84	VIRCAM	K	IMG	ZYJHK
84	VIRCAM	L	IMG	ZYJHK
85	VIRCAM	M	IMG	ZYJHK
85	VIRCAM	N	IMG	ZYJHK
86	VIRCAM	O	IMG	ZYJHK
86	VIRCAM	P	IMG	ZYJHK
87	VIRCAM	Q	IMG	ZYJHK
87	VIRCAM	R	IMG	ZYJHK
88	VIRCAM	S	IMG	ZYJHK
88	VIRCAM	T	IMG	ZYJHK

3a.Run	Period	Instrument	Time	Month	Moon	Seeing	Sky Trans.	Obs.Mode
<i>...continuing from box 3, first page.</i>								
M	85	VIRCAM	256h	any	n	≤ 1.4"	THN	s
N	85	VIRCAM	55h	any	g	≤ 1.4"	THN	s
O	86	VIRCAM	256h	any	n	≤ 1.4"	THN	s
P	86	VIRCAM	55h	any	g	≤ 1.4"	THN	s
Q	87	VIRCAM	256h	any	n	≤ 1.4"	THN	s
R	87	VIRCAM	55h	any	g	≤ 1.4"	THN	s
S	88	VIRCAM	256h	any	n	≤ 1.4"	THN	s
T	88	VIRCAM	55h	any	g	≤ 1.4"	THN	s