Visible & Infrared Survey Telescope for Astronomy

IR CAMERA

Document Title: **IR Camera Throughput Budget**

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Change Record

Issue	Date	Section(s) Affected	Description of Change/Change Request Reference/Remarks
Draft 0.1	18/10/02	All	New document
0.2	30/10/02	Marked	Added data & references in table
0.3	30/10/02	All	Tidy Up
1	29/11/02	Signatures added	1st issue
2	28/10/03	Sect. 5 and 6	Added lenses and filters manufacturers data

Notification List

The following people should be notified by email that a new version of this document has been issued and is available on the IR Camera Sharepoint database:

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1 SCOPE

This document controls the camera budget for optical throughput.

2 ACRONYMS & ABBREVIATIONS

ADxx	Applicable Document No xx
VISTA	Visible and Infrared Survey Telescope for Astronomy
VPO	VISTA Project Office

3 APPLICABLE DOCUMENTS

AD01	VISTA IR Camera Tech Spec	VIS-SPC-ATC-60000-00004

4 Requirements

The AD1, section 3.12 gives the camera requirements on wavelength bands, and throughput within those bands.

Separate requirements cover the cases with & without the filters present.

An initial budget for the camera elements (excluding detector) is given in the spreadsheet (next section). The data & assumptions used are included.

5 Budget table

Band		WFS & future sloan z	Y	J	H	Ks	K
Centre	um	0.875	1.02	1.25	1.65	2.15	2.2
width	um	0.25	0.1	0.2	0.3	0.3	0.41
Losses, %							
window	front	2.5	2.5	2.5	2.5	2.5	2.5
	bulk + dust	1.1	1.1	1.1	1.1	1.1	1.1
	rear	2.5	2.5	2.5	2.5	2.5	2.5
lens L1	front	1.5	1.5	1.5	1.5	1.5	1.5
	bulk	0.1	0.1	0.1	0.1	0.1	0.1
	rear	2.5	2.5	2.5	2.5	2.5	2.5
lens L3	front	1.5	1.5	1.5	1.5	1.5	1.5
	bulk	0.1	0.1	0.1	0.1	0.1	0.1
	rear	1.5	1.5	1.5	1.5	1.5	1.5
lens L3	front	1.5	1.5	1.5	1.5	1.5	1.5
	bulk	0.1	0.1	0.1	0.1	0.1	0.1
	rear	1.5	1.5	1.5	1.5	1.5	1.5
System throughput		0.847398627	0.847399	0.847399	0.847399	0.847399	0.847399
Win & lenses alone		**0.85**					
Filter		0.7	0.8	0.85	0.85	0.82	0.8
Total		0.59	**0.68**	**0.72**	**0.72**	**0.69**	0.68

Notes.

1. Numbers in bold are those for which a specification applies.
2. Each glass surface assumes A/R coating of 1.5% loss, except for the window surfaces and L1 second surface that will be coated with one layer of MgF2. We assumed a coating thickness optimized for a central wavelength of ~1.5 microns, and a waveband interval of [0.8-2.5] microns.
3. Window outer surface has higher value to account for dusty case.
4. Bulk absorption of Infrasil silica is estimated at 0.1% for each element based on manufacturer's datasheet comparison of external & internal transmission of 10mm thick sample.
5. Filter transmissivity from: J, H, Ks : UIST plots, averaged over the in-band region. , ref. www.jach.hawaii.edu. Y : ingrid, ref www.ast.cam.ac.uk. sloan z: UFTI instrument, ref. www.jach.hawaii.edu. Updated data from NDC and Spectrogon filters manufacturers (worst case considered). Z' and Kl filters transmissivity estimated from NDC, Spectrogon and ROE filters manufacturers.

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