1 Photometric transfer coefficients

1.1 Standard resolution mode

The photometric calibration has been obtained from the observations of seven standard star fields (Landolt 1992) shown in table 1.

Field	date	filter	mode	date	filter	mode
Mark A	1999-11-01	BVRI	s	1999-11-11	BVRI	s
	1999-11-02	BVRI	s,h	1999-11-12	BVRI	h
	1999-11-04	BVRI	s	1999-11-13	BVRI	s
	1999-11-06	BVRI	s	1999-11-15	BVRI	s
	1999-11-07	UBVRI	s,h	1999-11-16	BVRI	s
	1999-11-08	UBVRI	s	1999-11-17	UBVRI	s
	1999-11-09	BVRI	h	1999-11-18	UBVRI	s
	1999-11-10	BVRI	s			
PG 0231	1999-11-02	BVRI	h	1999-11-17	BV	s
	1999-11-03	BVRI	h	1999-11-18	UBV	s
	1999-11-16	BV	s			
PG 0918	1999-11-02	BVRI	s,h			
PG 1047	1999-11-13	BVRI	s,h			
PG 2213	1999-11-05	BVRI	s	1999-11-13	BVRI	s
	1999-11-06	BVRI	s	1999-11-18	BVRI	s
	1999-11-11	BVRI	s			
PG 2331	1999-11-06	BVRI	s	1999-11-11	BVRI	s
	1999-11-08	BVRI	s	1999-11-13	BVRI	s
	1999-11-09	BVRI	h			
Rubin 149	1999-11-09	BVRI	s	1999-11-18	UB	s
	1999-11-16	UB	s			

Table 1: List of the fields observed for the photometric calibrations.

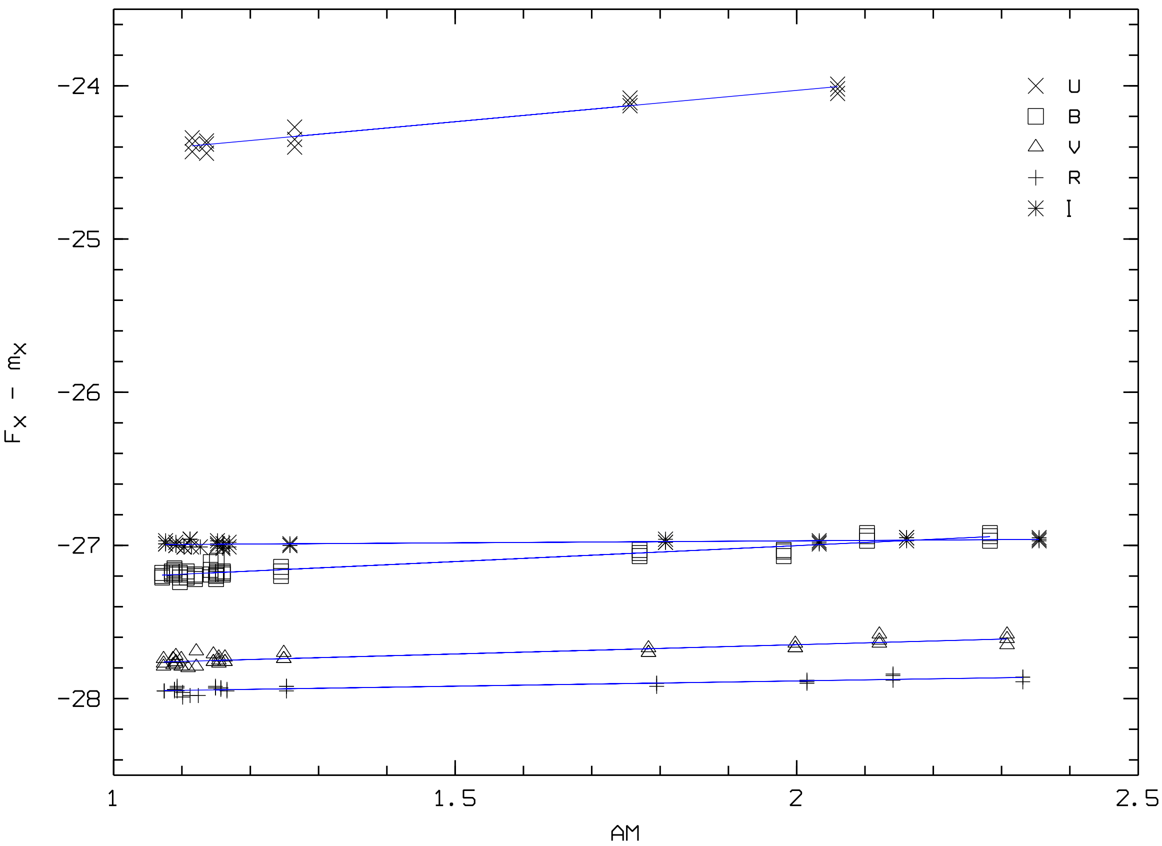
The aperture diameter was set to $10''$. The magnitude was computed by integrating over the area defined by the circular aperture and subtracting the local background as integrated over the given background area.
The magnitude of an object in the subsequent broad band color filters is

given by:

$$\begin{aligned}
U &= -2.5\log(f_{\mathrm{U}}) + Z_{\mathrm{U}} - C_{\mathrm{U}} \cdot (\mathrm{U}-\mathrm{B}) - A_{\mathrm{U}} \cdot AM \\
B &= -2.5\log(f_{\mathrm{B}}) + Z_{\mathrm{B}} - C_{\mathrm{B}} \cdot (\mathrm{B}-\mathrm{V}) - A_{\mathrm{B}} \cdot AM \\
V &= -2.5\log(f_{\mathrm{V}}) + Z_{\mathrm{V}} - C_{\mathrm{V}} \cdot (\mathrm{V}-\mathrm{R}) - A_{\mathrm{V}} \cdot AM \\
R &= -2.5\log(f_{\mathrm{R}}) + Z_{\mathrm{R}} - C_{\mathrm{R}} \cdot (\mathrm{R}-\mathrm{I}) - A_{\mathrm{R}} \cdot AM \\
I &= -2.5\log(f_{\mathrm{I}}) + Z_{\mathrm{I}} - C_{\mathrm{I}} \cdot (\mathrm{R}-\mathrm{I}) - A_{\mathrm{I}} \cdot AM
\end{aligned} \tag{1}$$

In a first step the atmospheric extinction was determined from the Mark A observations (see table 2 and image 1).

Image 1: The difference between the measured and the standard intensity plotted versus the airmass.



Then the calculation of the coefficients was done by:

i. Calculating mean zero points $\overline{Z_{\mathrm{X}}}$ (X = U, B, V, R, I, respectively) by setting $C_{\mathrm{X}} \equiv 0.0$ gives the first estimate for the Z_{X}.

ii. Computing equations 1 give values C_{X} and $C_{\mathrm{X},0}$.

iii. Addition of $C_{\mathrm{X},0}$ to Z_{X} refines the zero point values.

iv. Iteration of the second and third step until $C_{\mathrm{X},0} < \varepsilon = 5. \cdot 10^{-4}$ gives final values of Z_{X} and C_{X} shown in table 2.

Filter	Z_{X}	C_{X}	A_{X}
U $\rightarrow$ U-B	24.829±0.083	-0.111±0.030	0.409±0.028
B $\rightarrow$ B-V	27.471±0.058	0.074±0.013	0.207±0.011
V $\rightarrow$ V-R	27.871±0.036	-0.037±0.022	0.121±0.010
R $\rightarrow$ V-R	28.025±0.022	0.002±0.013	0.069±0.007
R $\rightarrow$ R-I	28.027±0.022	0.006±0.016	0.069±0.007
I $\rightarrow$ R-I	27.038±0.027	0.031±0.022	0.026±0.006

Table 2: Photometric transfer coefficients for the standard resolution mode.

The zero points for each measured star of the used standard star fields are shown in image 2.

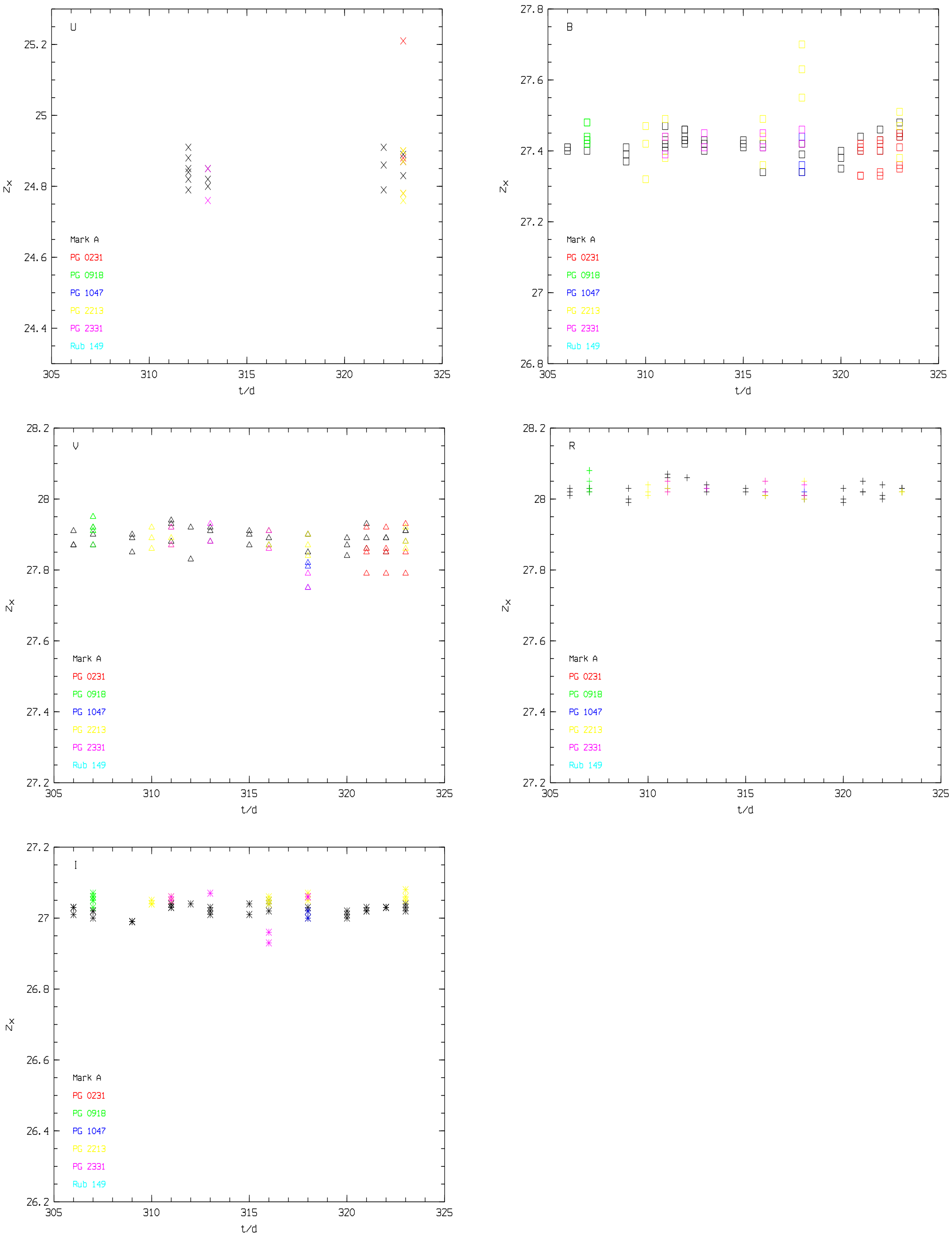


Image 2: Zero points of the measured standard stars in U, B, V, R, and I.

1.2 High resolution mode

The calibrations has been done on the observations marked by 'h' in table 1. The atmospheric extinction was taken from the standard mode observations since no observations at high airmasses were done in high resolution mode. To derive Z_{X} and C_{X} the same calculations were done as for the standard resolution mode. Because of the less number of measurements ε was set to $5. \cdot 10^{-3}$. The derived values of Z_{X} and C_{X} shown in table 3.

Filter	Z_{X}	C_{X}
U $\rightarrow$ U-B	24.820$\pm$0.081	-0.169$\pm$0.205
B $\rightarrow$ B-V	27.413$\pm$0.056	0.020$\pm$0.029
V $\rightarrow$ V-R	27.860$\pm$0.053	-0.055$\pm$0.048
R $\rightarrow$ R-I	28.047$\pm$0.031	0.079$\pm$0.029
I $\rightarrow$ R-I	27.053$\pm$0.026	0.058$\pm$0.027

Table 3: Photometric transfer coefficients for the high resolution mode.

Literatur

Landolt, A. U., 1992, AJ 104, 340