PRAYOSHA KAUSHIK DHIMMER

STUDENT ID: 216018475

GROUP: 02 (Nisha, Suba, Zeynep)

PHYS 4270

TERM PROJECT PART 3/3

Directory: Iraf ⟶ 2020-11-29+30

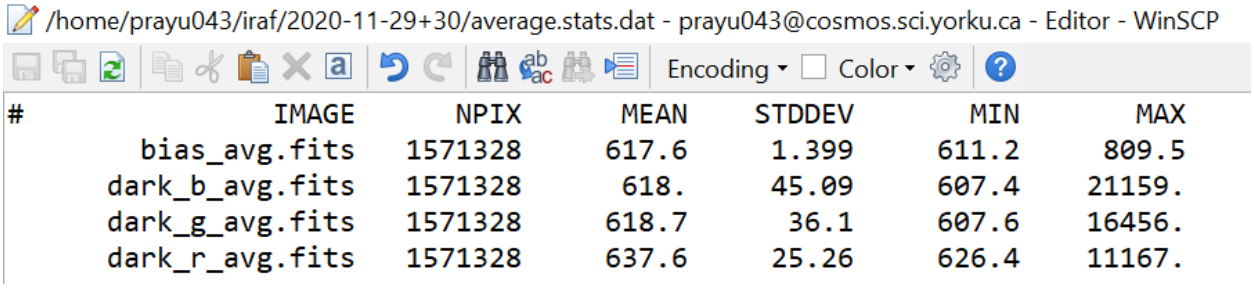
INTRODUCTION

A group of few thousand young stars that are held together by mutual gravitations forms an Open Cluster. They are formed by the same Giant molecular cloud and are generally only found in spiral or irregular galaxies in which there is an active formation of stars taking place. Open Clusters are thought of as very important objects when it comes to studying the Stellar Evolution.

The Open Cluster of stars, M34 (Messier 34) or NGC 1039, is about the size of the full moon, which lies in the constellation Perseus, about some 1800 light years away from us. The stars present in this open cluster are about 200 million years young. Messier 34 is one of the nearest Messier objects to Earth. It is visible to the naked eye provided good conditions. It contains both bright and faint stars.

We, the members of Group 02, booked the observatory thrice, the first two times were failure even though the sky were clear there were clouds that blocked us from observing. The third time (November 29th, 6:30 PM) even though it was partly cloudy we gave our best shot! The applications used from the Allan I. Carswell Observatory were Sky-X, and Plane-Wave Interface.

The observational data are called raw data as there is still processing and reducing to happen! Reducing the data included inspecting the data, determining our dark current and the bias level. When comparing the bias in the beginning to the average one, the average bias looked much more precise in a way and clear, structure wise the average bias looked more revealing than the beginners.



# IMAGE	NPIX	MEAN	STDDEV	MIN	MAX
bias_avg.fits	1571328	617.6	1.399	611.2	809.5
dark_b_avg.fits	1571328	618.	45.09	607.4	21159.
dark_g_avg.fits	1571328	618.7	36.1	607.6	16456.
dark_r_avg.fits	1571328	637.6	25.26	626.4	11167.

Fig 1: Average level for the Bias and the Dark Current.

This was followed by taking the average of all the flat fields and subtracting that from the average bias using imarith. And combining those images using combine=median function, thus arriving to the final flats in all the 3 filters. Later, the mean of final flats was set to 1. Now, for correcting the science images it was important to make sure about the significance of the dark current. Using the information provided in Fig1.,

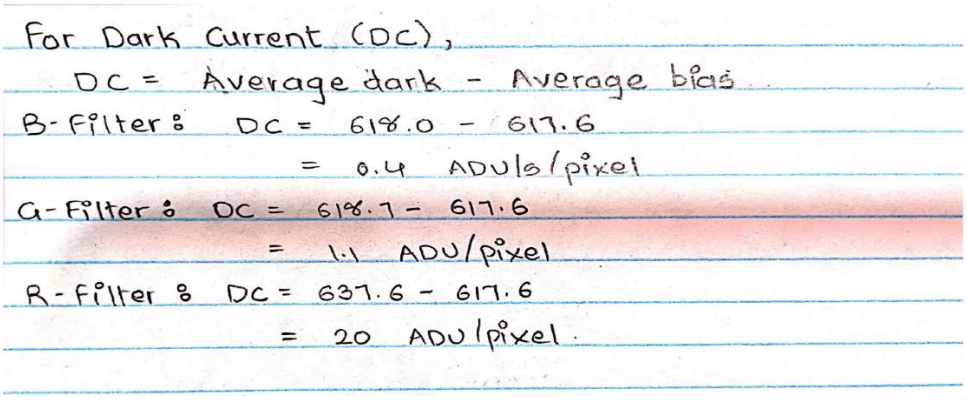


Fig 2: Determining the significance of Dark current.

As seen, the Dark Current is insignificance in B and G Filter so subtracting average bias from the M34 images of B and G filter whereas for the R-filter as the Dark Current is significant, we subtract average dark from the M34 images of 4 filter, this is done by using the imarith option in IRAF. Further dividing all the subtracted M34 filter images with our normalized flat we successfully reduced our M34 images. Moving forward it is important to align our images using the imshift option of IRAF – instead of randomly selecting any one image as my reference image I tried to find the magnitude of centroid of the reference star from each image, next I took the mean of that magnitude and selected my reference image to be the one that has the nearest value centroid magnitude to the mean that I calculated. And than finally combining those using combine=average facility.

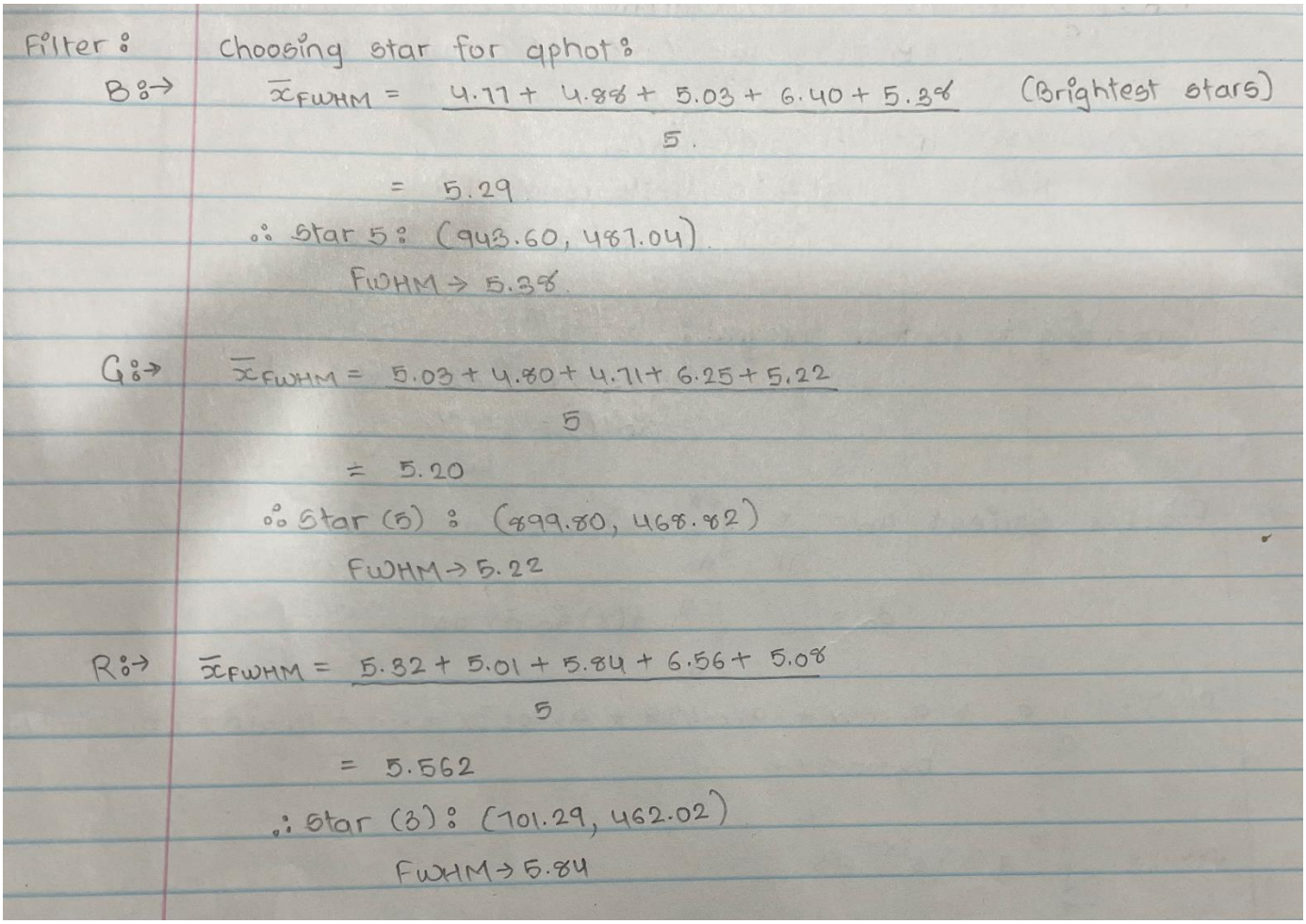
Names	Col (x)	Row (y)	Shift x	Shift y
Correct_M34B90s01.fits	737.92	608.84	14.53	-0.24
Correct_M34B90s02.fits	737.73	608.83	14.34	-0.25
Correct_M34B90s03.fits	737.65	608.56	14.26	-0.52
Correct_M34B90s04.fits	737.35	608.76	13.96	-0.32
Correct_M34B90s05.fits	737.29	608.50	13.9	-0.58
Correct_M34B90s06.fits	737.04	608.40	13.65	-0.68
Correct_M34B90s07.fits	736.74	608.59	13.35	-0.49
Correct_M34B90s08.fits	736.69	608.36	13.3	-0.72
Correct_M34B90s09.fits	736.19	608.39	12.8	-0.69
Correct_M34B90s10.fits	736.00	608.12	12.61	-0.96
Correct_M34G90s01.fits	723.85	607.75	0.46	-1.33
Correct_M34G90s02.fits	723.77	607.97	0.38	-1.11
Correct_M34G90s03.fits	723.64	608.52	0.25	-0.56
Correct_M34G90s04.fits	**723.39**	**609.08**	**0**	**0**
Correct_M34G90s05.fits	722.83	609.52	-0.56	0.44
Correct_M34G90s06.fits	722.70	609.55	-0.69	0.47
Correct_M34G90s07.fits	722.14	609.52	-1.25	0.44
Correct_M34G90s08.fits	721.70	609.54	-1.69	0.46
Correct_M34G90s09.fits	721.65	609.71	-1.74	0.63
Correct_M34G90s10.fits	721.43	610.06	-1.96	0.98
Correct_M34R85s11.fits	712.40	613.65	-10.99	4.57
Correct_M34R85s12.fits	712.29	614.06	-11.1	4.98
Correct_M34R85s13.fits	712.08	613.91	-11.31	4.83
Correct_M34R85s14.fits	711.99	614.15	-11.4	5.07
Correct_M34R85s15.fits	712.02	614.56	-11.37	5.48
Correct_M34R85s16.fits	712.11	614.80	-11.28	5.72
Correct_M34R85s17.fits	711.85	614.77	-11.54	5.69
Correct_M34R85s18.fits	712.06	615.33	-11.33	6.25
Correct_M34R85s19.fits	711.95	615.55	-11.44	6.47
Correct_M34R85s20.fits	712.32	615.99	-11.07	6.91

Table 1: Aligning Images Reference

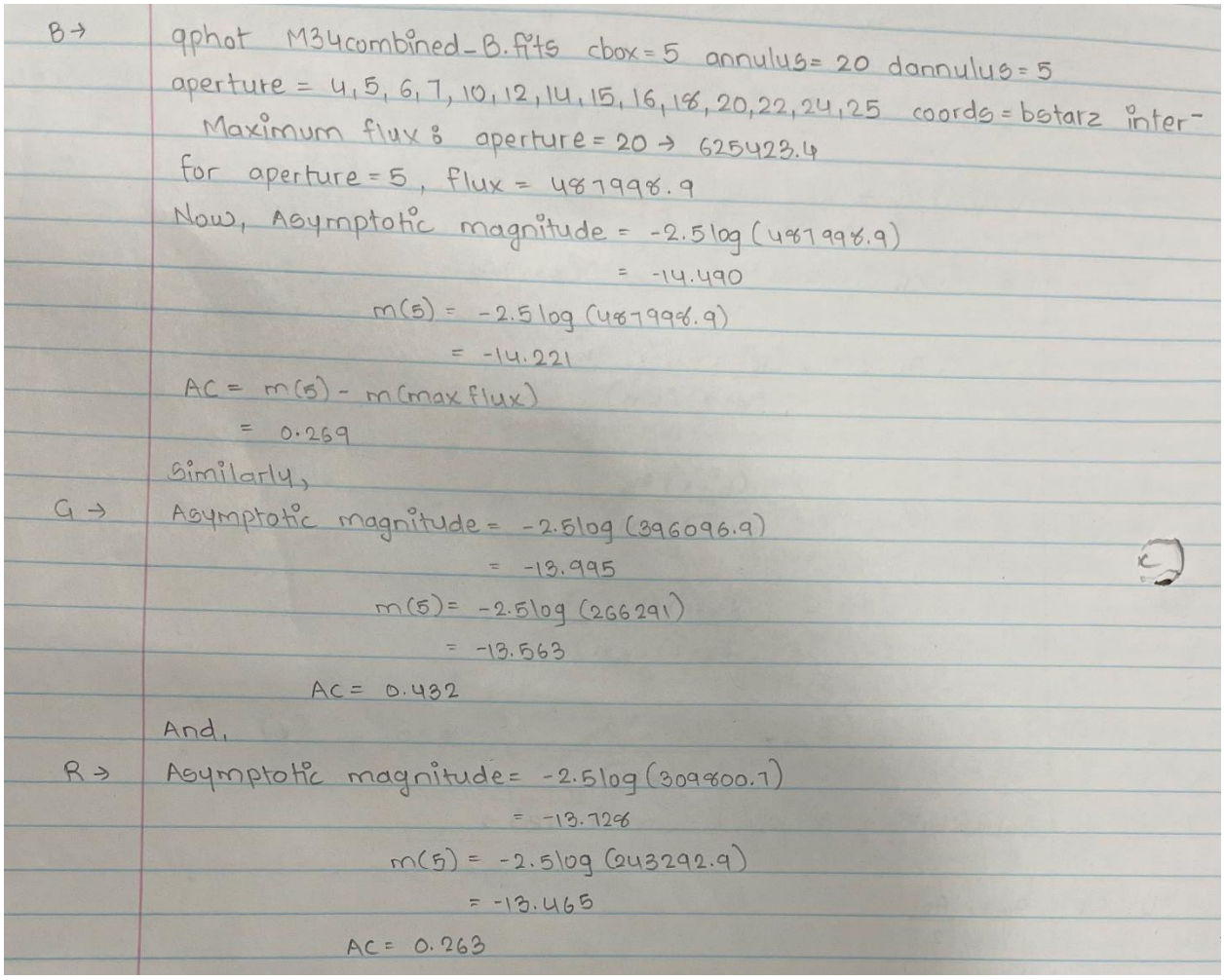
After Data Reductions the step forward was Astrometry and Photometry. To begin, there was a curve of growth analysis done using the qphot facility of the IRAF. However, given that we did observing thrice, and the third time being our last shot, it did not come up until 16th December,2020 that our observing did not include as much stars as we wanted as the weather was partly cloudy. Henceforth, we did not have 60 stars to refer too but rather a very less amount of the same. For choosing an isolated star to determine the optimal aperture radius and aperture correction, Table 2 was used.

Star	IMAGE	CENTROID	FWHM
1	M34combined_B.fits	(757.03, 546.73)	4.77
1	M34combined_G.fits	(721.01, 548.15)	5.03
1	M34combined_R.fits	(692.27, 559.74)	5.32
2	M34combined_B.fits	(750.45, 607.97)	4.88
2	M34combined_G.fits	(721.25, 609.65)	4.80
2	M34combined_R.fits	(700.80, 620.64)	5.01
3	M34combined_B.fits	(790.17, 454.34)	5.03
3	M34combined_G.fits	(743.62, 452.80)	4.71
3	M34combined_R.fits	(701.29, 462.02)	5.84
4	M34combined_B.fits	(912.34, 531.22)	6.40
4	M34combined_G.fits	(873.40, 515.75)	6.25
4	M34combined_R.fits	(838.11, 506.04)	6.56
5	M34combined_B.fits	(943.60, 487.04)	5.38
5	M34combined_G.fits	(899.80, 468.82)	5.22
5	M34combined_R.fits	(857.79, 455.70)	5.08

Table 2: Reference stars for the curve of growth analysis.



For Aperture Correction,



The annulus value was chosen such that it 4 times the FWHM.

	A	B	C	D	E	F	G	H	I
2	**STARS**	**X**	**Y**	**FWHM**	**Flux(5)**	**m(flux)**	**m(flux) - AC**		
3	1	558.57	294.26	5.61	43310.41	-11.5915	-11.860481		
4	2	574.57	395.08	5.74	15499.21	-10.4758	-10.744774		
5	3	731.48	324.47	5.4	57938.03	-11.9074	-12.176409		
6	4	850.84	351.98	5.41	79406.29	-12.2496	-12.518637		
7	5	662.56	429.79	5.71	604068.7	-14.4527	-14.721716		
8	6	790.17	454.34	5.03	230143.7	-13.405	-13.673998		
9	7	949.25	377.58	5.44	34264.65	-11.3371	-11.606116		
10	8	943.6	487.04	5.38	487998.9	-14.221	-14.490047		
11	9	912.35	531.28	6.38	1177130	-15.1771	-15.446061		
12	10	757.03	546.73	4.77	155857.2	-12.9818	-13.250817		
13	11	750.44	607.97	4.88	583309.9	-14.4147	-14.683748		
14	12	894.28	715.6	5.96	1243215	-15.2364	-15.505366		
15	13	969.27	609.68	4.93	33355.54	-11.3079	-11.57692		
16	14	646.65	341.45	1.52	3171.089	-8.75302	-9.0220211		
17	15	574.57	395.08	5.74	15499.21	-10.4758	-10.744774		
18	16	650.59	661.49	4.32	12070.62	-10.2043	-10.473324		
19	17	748.67	675.44	1.6	3480.431	-8.85408	-9.1230826		
20	18	827.12	682.79	4.32	5189.661	-9.28785	-9.5568475		
21	19	865.73	652.41	1.73	1096.767	-7.60029	-7.8692859		
22	20	882.55	575.43	1.33	1287.978	-7.77477	-8.0437711		
23	21	840.68	379.44	1.56	1432.496	-7.89023	-8.1592335		
24	22	768.72	282.43	1.69	3058.828	-8.71389	-8.9828876		
25	23	574.66	604.44	1.56	1079.757	-7.58332	-7.8523151		
26	24	564.63	609.44	1.58	1553.928	-7.97858	-8.2475772		
27	25	710.73	611.48	1.64	1087.233	-7.59081	-7.8598066		
28	26	630.21	538.24	1.79	349.5085	-6.35864	-6.6276444		
29	27	757.87	370.53	5.09	3156.553	-8.74803	-9.0170327		
30	28	865.44	401.15	5.2	3216.052	-8.76831	-9.0373077		
31	29	997.61	449.41	1.49	723.1602	-7.14809	-7.4170863		
32	30	982.67	560.63	2.12	477.8944	-6.69833	-6.9673299		
33	31	720.68	748.44	1.57	7794.648	-9.72949	-9.9984913		
34	32	656.59	745.46	1.38	1160.929	-7.66201	-7.9310142		
35	33	568.01	325.36	2.64	691.5214	-7.09951	-7.3685141		
36	34	949.1	377.15	5.37	33760.48	-11.321	-11.590022		
37	35	820.35	419.39	18.81	739.6644	-7.17259	-7.4415868		
38	36	699.97	600.01	1.88	344.4297	-6.34275	-6.6117515		
39	37	652.81	635.4	4.67	1631.725	-8.03162	-8.3006174		
40	38	819.84	603.74	1.85	445.2606	-6.62154	-6.8905357		
41	39	646.65	341.45	1.52	3171.089	-8.75302	-9.0220211		
42	40	939.84	427.44	1.8	718.8479	-7.14159	-7.4105925		

Fig 3: B-filter Stars Magnitude

1	G-FILTER		Centroids = (x,y)			AC= Aperture Correction = 0.432	
2	**STARS**	**X**	**Y**	**FWHM**	**Flux(5)**	**m(flux)**	**m(flux) - AC**
3	1	671.5	330.2	5	37447.76	-11.4336	-11.8655646
4	2	793.23	344.69	5	43399.8	-11.5937	-12.0257193
5	3	894.15	359.62	5.85	23964.96	-10.9489	-11.3809418
6	4	812.18	391.94	4.47	3551.959	-8.87617	-9.30816986
7	5	524.52	416.78	7.34	16403.45	-10.5373	-10.969338
8	6	614.62	442.21	5.89	310485.2	-13.7301	-14.1621023
9	7	744.82	452.59	6.13	132021.3	-12.8016	-13.23361
10	8	781.36	459.3	2.35	2253.578	-8.38218	-8.81418149
11	9	900.66	468.9	6.27	269273	-13.5755	-14.007482
12	10	874.32	515.82	6.8	786135.1	-14.7387	-15.170743
13	11	721.8	547.98	6	100803.6	-12.5087	-12.9406901
14	12	721.69	609.49	5.5	347787.3	-13.8533	-14.2852843
15	13	939.62	588.31	5.73	32895.39	-11.2928	-11.7248376
16	14	876.07	701.03	5.12	840394	-14.8112	-15.2432074
17	15	984.53	747.02	4.33	41487.52	-11.5448	-11.9767937
18	16	806.07	675.69	4.41	6305.443	-9.49929	-9.93128901
19	17	628.13	673.55	5.04	11337.72	-10.1363	-10.5683143
20	18	706.21	749.16	2.74	8149.012	-9.77776	-10.2097624
21	19	524.59	416.48	7.51	17202.23	-10.589	-11.0209619
22	20	754.34	283.14	2.47	3620.52	-8.89693	-9.32892738
23							
24							

Fig 4: G-Filter Stars Magnitude

1	R-FILTER			Centroids = (x,y)			AC= Aperture Correction=0.263
2	STARS	X	Y	FWHM	Flux(5)	m(flux)	m(flux) - AC
3	1	611.21	351.9	5.55	69542.4	-12.1056	-12.368624
4	2	733.72	348.08	5.44	81023.96	-12.2715	-12.534534
5	3	835.34	348.36	4.57	51785.1	-11.7855	-12.048512
6	4	889.5	356.2	5.49	8392.939	-9.80979	-10.072785
7	5	863.97	366.65	6.16	8937.317	-9.87802	-10.141018
8	6	760.33	391.92	5.6	11814.8	-10.1811	-10.444066
9	7	743.89	289	2.39	535.3033	-6.8215	-7.0844998
10	8	571.23	470.11	7.26	405444.2	-14.0198	-14.282828
11	9	701.29	462.02	5.84	243292.9	-13.4653	-13.728324
12	10	857.79	455.7	5.08	410889.4	-14.0343	-14.297312
13	11	838.11	506.04	6.56	863577.3	-14.8408	-15.103753
14	12	692.27	559.74	5.32	184796.8	-13.1667	-13.429736
15	13	700.8	620.64	5.01	455113.2	-14.1453	-14.408299
16	14	913.5	568.29	4.15	66232.59	-12.0527	-12.315679
17	15	866.3	689.13	6.53	850969.3	-14.8248	-15.087785
18	16	980.83	718.61	5.62	73855.9	-12.171	-12.433963
19	17	918.85	764.04	5.7	647258.6	-14.5277	-14.790695
20	18	695.81	754.45	1.44	9753.034	-9.97285	-10.235849
21	19	617.45	697.83	5.98	23451.08	-10.9254	-11.188407
22	20	793.75	673.96	4	13809.62	-10.3505	-10.613454
23							

Fig 5: R-Filter Stars Magnitude

The sky background in each filter was measured using imexamine facility of the IRAF.

Filter	Mean	Standard Deviation
B	4445	7.708
	4425	8.292
	4421	6.558
	4436	7.688
G	22949	18.52
	22988	24.03
	23082	20.6
	22960	21.36
R	37141	18.77
	37351	22.68
	37263	17.43
	37513	23.13

Table 3: Sky Background

Moving to the Astrometry part, for B filter:

	RA (J2000)	Dec (J2000)	Centroid
A →	2h42m14.4s	+42°51'59"	(750.45, 607.97)
B →	2h42m10.6s	+42°49'56"	(757.03, 546.73)

$dx = x(B) - x(A) = 757.03 - 750.45 = 6.58$ px

$dy = y(B) - y(A) = 546.73 - 607.97 = -61.24$ px

$$ds = \sqrt{(dx)^2 + (dy)^2} = \sqrt{43.2964 + 3750.3376}$$

$ds = 61.59$ px

$dRA'' = 15\, dRA(s) * \cos(Dec)$

$= 15(-3.8s) * \cos(0.849°)$

$= 56.99''$

For Dec°:
1° → 60′ A → 0.866°
1′ → 60″ B → 0.832°

$dDec'' = 49'56'' - 51'59''$

$= 3'' + (2 \times 60)''$

$= 123''$

$$ds'' = \sqrt{(dRA'')^2 + (dDec'')^2} = \sqrt{3247.860 + 15129}$$

$ds'' = 135.56''$

The pixel scale / focal-plane scale $= \frac{ds''}{ds}$

$= 2.201$ arcsec/pixel.

lter → For tilt, $\sin(PA(CCD)) = \frac{dx}{ds}$

$$PA(CCD) = \arcsin\left(\frac{6.58}{61.593}\right)$$

$= 6.133$ degree

And, $\sin(PA(RA/Dec)) = \frac{dRA''}{ds''}$

$$PA(RA/Dec) = \arcsin\left(\frac{56.99}{135.56}\right) = 24.86 \text{ degree}$$

∴ CCD columns are tilted by: -18.73 degrees.
-ve sign reflects clockwise rotation.

→ For RA/Dec:

$RA(1) = RA(A) - (dx'' \cos(T) + dy'' \sin(T))$

$= 9734.4 - (dx'' \cos(-18.73) + dy'' \sin(-18.73))$

$Dec(1) = Dec(A) + (-dx'' \sin(T) + dy'' \cos(T))$

$= 154319 + (-dx'' \sin(-18.73) + dy'' \cos(-18.73))$

* G-filter:

A → (721.69, 609.49) $dx = 0.11$

B → (721.80, 547.98) $dy = -61.51$

∴ $ds = 61.51$ px

$ds'' = 135.56''$

The pixel scale = 2.204 arcsec/pixel

For tilt, $PA(CCD) = \arcsin\left(\frac{0.11}{61.51}\right)$

$PA(CCD) = 0.103$ degree

$PA(RA/Dec) = 24.86$ degree.

∴ CCD columns are tilted by: -24.76 degrees.
-ve sign reflects clockwise rotation.

→ For RA/Dec:

$RA(1) = 9734.4 - (dx'' \cos(-24.76) + dy'' \sin(-24.76))$

$Dec(1) = 154319 - (-dx'' \sin(-24.76) + dy'' \cos(-24.76))$

* R-filter:

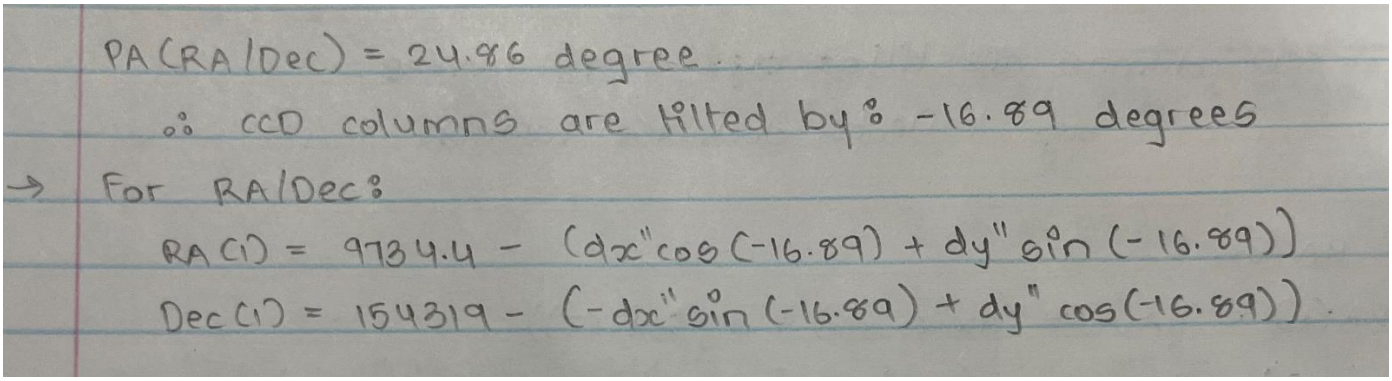
A → (700.80, 620.64) $dx = -8.53$

B → (692.27, 559.74) $dy = -60.9$

∴ $ds = 61.49$ px

$ds'' = 135.56''$, pixel scale = 2.205 arcsec/pixel

For tilt, $PA(CCD) = \arcsin\left(\frac{8.53}{61.49}\right) = 7.974$ degree.



1	B FILTER		Centroids = (x,y)			AC= Aperture Correction = 0.269				A=(750.45,607.97)					
2	STARS	X	Y	FWHM	Flux(5)	m(flux)	m(flux) - AC	dx	dy	dx*cos(T)	dy*sin(T)	RA	dx*sin(T)	dy*cos(T)	Dec
3	1	558.57	294.26	5.61	43310.4	-11.5915	-11.860481	-191.88	-313.71	-190.51	-37.4166	9962.33	-22.8858	-311.471	154030
4	2	574.57	395.08	5.74	15499.2	-10.4758	-10.744774	-175.88	-212.89	-174.625	-25.3917	9934.42	-20.9774	-211.37	154129
5	3	731.48	324.47	5.4	57938	-11.9074	-12.176409	-18.97	-283.5	-18.8346	-33.8134	9787.05	-2.26258	-281.476	154040
6	4	850.84	351.98	5.41	79406.3	-12.2496	-12.518637	100.39	-255.99	99.67339	-30.5323	9665.26	11.9736	-254.163	154053
7	5	662.56	429.79	5.71	604069	-14.4527	-14.721716	-87.89	-178.18	-87.2626	-21.2518	9842.91	-10.4828	-176.908	154153
8	6	790.17	454.34	5.03	230144	-13.405	-13.673998	39.72	-153.63	39.43647	-18.3237	9713.29	4.73746	-152.533	154162
9	7	949.25	377.58	5.44	34264.7	-11.3371	-11.606116	198.8	-230.39	197.3809	-27.4789	9564.5	23.7111	-228.745	154067
10	8	943.6	487.04	5.38	487999	-14.221	-14.490047	193.15	-120.93	191.7712	-14.4235	9557.05	23.0373	-120.067	154176
11	9	912.35	531.28	6.38	1177130	-15.1771	-15.446061	161.9	-76.69	160.7443	-9.14692	9582.8	19.31	-76.1426	154224
12	10	757.03	546.73	4.77	155857	-12.9818	-13.250817	6.58	-61.24	6.53303	-7.30418	9735.17	0.78481	-60.8029	154257
13	11	750.44	607.97	4.88	583310	-14.4147	-14.683748	-0.01	0	-0.00993	0	9734.41	-0.00119	0	154319
14	12	894.28	715.6	5.96	1243215	-15.2364	-15.505366	143.83	107.63	142.8033	12.8372	9578.76	17.1548	106.862	154409
15	13	969.27	609.68	4.93	33355.5	-11.3079	-11.57692	218.82	1.71	217.258	0.20395	9516.94	26.0989	1.69779	154295
16	14	646.65	341.45	1.52	3171.09	-8.75302	-9.0220211	-103.8	-266.52	-103.059	-31.7882	9869.25	-12.3804	-264.618	154067
17	15	574.57	395.08	5.74	15499.2	-10.4758	-10.744774	-175.88	-212.89	-174.625	-25.3917	9934.42	-20.9774	-211.37	154129
18	16	650.59	661.49	4.32	12070.6	-10.2043	-10.473324	-99.86	53.52	-99.1472	6.3834	9827.16	-11.9104	53.138	154384
19	17	748.67	675.44	1.6	3480.43	-8.85408	-9.1230826	-1.78	67.47	-1.76729	8.04724	9728.12	-0.2123	66.9884	154386
20	18	827.12	682.79	4.32	5189.66	-9.28785	-9.5568475	76.67	74.82	76.12271	8.92388	9649.35	9.14453	74.2859	154384
21	19	865.73	652.41	1.73	1096.77	-7.60029	-7.8692859	115.28	44.44	114.4571	5.30042	9614.64	13.7496	44.1228	154349
22	20	882.55	575.43	1.33	1287.98	-7.77477	-8.0437711	132.1	-32.54	131.157	-3.88109	9607.12	15.7557	-32.3077	154271
23	21	840.68	379.44	1.56	1432.5	-7.89023	-8.1592335	90.23	-228.53	89.58591	-27.2571	9672.07	10.7619	-226.899	154081
24	22	768.72	282.43	1.69	3058.83	-8.71389	-8.9828876	18.27	-325.54	18.13958	-38.8276	9755.09	2.17909	-323.216	153994
25	23	574.66	604.44	1.56	1079.76	-7.58332	-7.8523151	-175.79	-3.53	-174.535	-0.42103	9909.36	-20.9667	-3.5048	154336
26	24	564.63	609.44	1.58	1553.93	-7.97858	-8.2475772	-185.82	1.47	-184.494	0.17533	9918.72	-22.163	1.45951	154343
27	25	710.73	611.48	1.64	1087.23	-7.59081	-7.8598066	-39.72	3.51	-39.4365	0.41864	9773.42	-4.73746	3.48494	154327
28	26	630.21	538.24	1.79	349.509	-6.35864	-6.6276444	-120.24	-69.73	-119.382	-8.31679	9862.1	-14.3412	-69.2322	154264
29	27	757.87	370.53	5.09	3156.55	-8.74803	-9.0170327	7.42	-237.44	7.367034	-28.3198	9755.35	0.88499	-235.745	154082
30	28	865.44	401.15	5.2	3216.05	-8.76831	-9.0373077	114.99	-206.82	114.1692	-24.6677	9644.9	13.715	-205.344	154100
31	29	997.61	449.41	1.49	723.16	-7.14809	-7.4170863	247.16	-158.56	245.3957	-18.9117	9507.92	29.4791	-157.428	154132
32	30	982.67	560.63	2.12	477.894	-6.69833	-6.9673299	232.22	-47.34	230.5623	-5.6463	9509.48	27.6972	-47.0021	154244
33	31	720.68	748.44	1.57	7794.65	-9.72949	-9.9984913	-29.77	140.47	-29.5575	16.754	9747.2	-3.55071	139.467	154462
34	32	656.59	745.46	1.38	1160.93	-7.66201	-7.9310142	-93.86	137.49	-93.19	16.3986	9811.19	-11.1948	136.509	154467
35	33	568.01	325.36	2.64	691.521	-7.09951	-7.3685141	-182.44	-282.61	-181.138	-33.7073	9949.24	-21.7599	-280.593	154060
36	34	949.1	377.15	5.37	33760.5	-11.321	-11.590022	198.65	-230.82	197.232	-27.5302	9564.7	23.6932	-229.172	154066
37	35	820.35	419.39	18.81	739.664	-7.17259	-7.4415868	69.9	-188.58	69.40103	-22.4922	9687.49	8.33706	-187.234	154123
38	36	699.97	600.01	1.88	344.43	-6.34275	-6.6117515	-50.48	-7.96	-50.1197	-0.9494	9785.47	-6.02082	-7.90318	154317
39	37	652.81	635.4	4.67	1631.73	-8.03162	-8.3006174	-97.64	27.43	-96.943	3.27161	9828.07	-11.6457	27.2342	154358
40	38	819.84	603.74	1.85	445.261	-6.62154	-6.8905357	69.39	-4.23	68.89467	-0.50452	9666.01	8.27624	-4.1998	154307
41	39	646.65	341.45	1.52	3171.09	-8.75302	-9.0220211	-103.8	-266.52	-103.059	-31.7882	9869.25	-12.3804	-264.618	154067
42	40	939.84	427.44	1.8	718.848	-7.14159	-7.4105925	189.39	-180.53	188.0381	-21.532	9567.89	22.5888	-179.241	154117

Fig 6: RA-Dec of stars in B-Filter

1	G-FILTER		Centroids = (x,y)			AC= Aperture Correction = 0.432				A=(721.69,609.49)					
2	STARS	X	Y	FWHM	Flux(5)	m(flux)	m(flux) - AC	dx	dy	dx*cos(T)	dy*sin(T)	RA	dx*sin(T)	dy*cos(T)	Dec
3	1	671.5	330.2	5	37447.76	-11.4336	-11.8655646	-50.19	-279.29	-46.7436	-101.709	9882.853	-18.2777	-94.7249	154242.6
4	2	793.23	344.69	5	43399.8	-11.5937	-12.0257193	71.54	-264.8	66.62753	-96.4322	9764.205	26.05271	-89.8104	154203.1
5	3	894.15	359.62	5.85	23964.96	-10.9489	-11.3809418	172.46	-249.87	160.6176	-90.9951	9664.777	62.80472	-84.7467	154171.4
6	4	812.18	391.94	4.47	3551.959	-8.87617	-9.30816986	90.49	-217.55	84.27628	-79.2251	9729.349	32.95372	-73.785	154212.3
7	5	524.52	416.78	7.34	16403.45	-10.5373	-10.969338	-197.17	-192.71	-183.631	-70.1792	9988.21	-71.8034	-65.3601	154325.4
8	6	614.62	442.21	5.89	310485.2	-13.7301	-14.1621023	-107.07	-167.28	-99.7178	-60.9183	9895.036	-38.9917	-56.7352	154301.3
9	7	744.82	452.59	6.13	132021.3	-12.8016	-13.23361	23.13	-156.9	21.54172	-57.1382	9769.997	8.423247	-53.2147	154257.4
10	8	781.36	459.3	2.35	2253.578	-8.38218	-8.81418149	59.67	-150.19	55.57261	-54.6947	9733.522	21.73001	-50.9389	154246.3
11	9	900.66	468.9	6.27	269273	-13.5755	-14.007482	178.97	-140.59	166.6806	-51.1986	9618.918	65.17547	-47.683	154206.1
12	10	874.32	515.82	6.8	786135.1	-14.7387	-15.170743	152.63	-93.67	142.1493	-34.1118	9626.362	55.58324	-31.7694	154231.6
13	11	721.8	547.98	6	100803.6	-12.5087	-12.9406901	0.11	-61.51	0.102447	-22.4001	9756.698	0.040059	-20.8619	154298.1
14	12	939.62	588.31	5.73	32895.39	-11.2928	-11.7248376	217.93	-21.18	202.9653	-7.71312	9539.148	79.36352	-7.18348	154232.5
15	13	876.07	701.03	5.12	840394	-14.8112	-15.2432074	154.38	91.54	143.7791	33.3361	9557.285	56.22053	31.047	154293.8
16	14	984.53	747.02	4.33	41487.52	-11.5448	-11.9767937	262.84	137.53	244.7915	50.08427	9439.524	95.71839	46.64511	154269.9
17	15	806.07	675.69	4.41	6305.443	-9.49929	-9.93128901	84.38	66.2	78.58584	24.10804	9631.706	30.72865	22.4526	154310.7
18	16	628.13	673.55	5.04	11337.72	-10.1363	-10.5683143	-93.56	64.06	-87.1355	23.32872	9798.207	-34.0717	21.72679	154374.8
19	17	706.21	749.16	2.74	8149.012	-9.77776	-10.2097624	-15.48	139.67	-14.417	50.86359	9697.953	-5.63735	47.37092	154372
20	18	524.59	416.48	7.51	17202.23	-10.589	-11.0209619	-197.1	-193.01	-183.566	-70.2884	9988.254	-71.7779	-65.4619	154325.3
21	19	754.34	283.14	2.47	3620.52	-8.89693	-9.32892738	32.65	-326.35	30.40801	-118.847	9822.839	11.89014	-110.686	154196.4

Fig 7: RA-Dec of stars in G-Filter

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	R-FILTER			Centroids = (x,y)			AC= Aperture Correction=0.263				A=(700.80,620.64)				
2	STARS	X	Y	FWHM	Flux(5)	m(flux)	m(flux) - AC	dx	dy	dx*cos(T)	dy*sin(T)	RA	dx*sin(T)	dy*cos(T)	Dec
3	1	611.21	351.9	5.55	69542.4	-12.1056	-12.368624	-89.59	-268.74	33.95827	-248.687	9949.128	-82.9048	101.8634	154503.8
4	2	733.72	348.08	5.44	81023.96	-12.2715	-12.534534	32.92	-272.56	-12.478	-252.222	9999.1	30.46351	103.3114	154391.8
5	3	835.34	348.36	4.57	51785.1	-11.7855	-12.048512	134.54	-272.28	-50.9962	-251.962	10037.36	124.5006	103.2052	154297.7
6	4	889.5	356.2	5.49	8392.939	-9.80979	-10.072785	188.7	-264.44	-71.525	-244.707	10050.63	174.6192	100.2336	154244.6
7	5	863.97	366.65	6.16	8937.317	-9.87802	-10.141018	163.17	-253.99	-61.8481	-235.037	10031.29	150.9942	96.27259	154264.3
8	6	760.33	391.92	5.6	11814.8	-10.1811	-10.444066	59.53	-228.72	-22.5643	-211.653	9968.617	55.08787	86.69423	154350.6
9	7	743.89	289	2.39	535.3033	-6.8215	-7.0844998	43.09	-331.64	-16.3329	-306.893	10057.63	39.87462	125.7051	154404.8
10	8	571.23	470.11	7.26	405444.2	-14.0198	-14.282828	-129.57	-150.53	49.11232	-139.297	9824.585	-119.901	57.05702	154496
11	9	701.29	462.02	5.84	243292.9	-13.4653	-13.728324	0.49	-158.62	-0.18573	-146.784	9881.369	0.453436	60.12346	154378.7
12	10	857.79	455.7	5.08	410889.4	-14.0343	-14.297312	156.99	-164.94	-59.5056	-152.632	9946.538	145.2754	62.519	154236.2
13	11	838.11	506.04	6.56	863577.3	-14.8408	-15.103753	137.31	-114.6	-52.0461	-106.049	9892.495	127.0639	43.43808	154235.4
14	12	692.27	559.74	5.32	184796.8	-13.1667	-13.429736	-8.53	-60.9	3.233219	-56.3556	9787.522	-7.89349	23.08359	154350
15	13	913.5	568.29	4.15	66232.59	-12.0527	-12.315679	212.7	-52.35	-80.622	-48.4436	9863.466	196.8283	19.84279	154142
16	14	866.3	689.13	6.53	850969.3	-14.8248	-15.087785	165.5	68.49	-62.7313	63.37927	9733.752	153.1504	-25.9605	154139.9
17	15	980.83	718.61	5.62	73855.9	-12.171	-12.433963	280.03	97.97	-106.143	90.65947	9749.883	259.1341	-37.1346	154022.7
18	16	918.85	764.04	5.7	647258.6	-14.5277	-14.790695	218.05	143.4	-82.6499	132.6995	9684.35	201.7791	-54.3545	154062.9
19	17	695.81	754.45	1.44	9753.034	-9.97285	-10.235849	-4.99	133.81	1.891414	123.8251	9608.683	-4.61765	-50.7195	154272.9
20	18	617.45	697.83	5.98	23451.08	-10.9254	-11.188407	-83.35	77.19	31.59306	71.43008	9631.377	-77.1304	-29.2582	154366.9
21	19	793.75	673.96	4	13809.62	-10.3505	-10.613454	92.95	53.32	-35.2318	49.34126	9720.291	86.01407	-20.2105	154212.8

Fig 8: RA-Dec of stars in R-Filter

For the photometry part,

B→ star B: (757.03, 546.73)

flux at aperture 5: 155857.2

For star B: V = +9.64

B-V = +1.08

∴ B = (B-V) + V

= 10.72

minst = -2.5 log (155857.2)

= -12.982

C = B - minst

C = 10.72 + 12.982

= 23.702

Uncertainty: $\sqrt{\frac{\Sigma (x-\text{mean})^2}{N}}$

where mean = avg. FWHM

G→ star B: (721.80, 547.98)

flux at aperture 5: 100803.6

minst = -2.5 log (100803.6)

= -12.51

C = 10.72 + 12.51

= 23.229

R→ star B: (692.27, 559.74)

Flux at aperture 5: 184796.8

minst = -2.5 log (184796.8)

= -13.17

C = 10.72 + 13.17

= 23.887

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	**B FILTER**		Centroids = (x,y)			AC= Aperture Correction = 0.269				A=(750.45,607.97)								
2	**STARS**	**X**	**Y**	**FWHM**	**Flux(5)**	**m(flux)**	**m(flux) - AC**	**dx**	**dy**	**dx*cos(T)**	**dy*sin(T)**	**RA**	**dx*sin(T)**	**dy*cos(T)**	**Dec**	**m(inst)**	**(x-mean)^2**	
3	1	558.57	294.26	5.61	43310.4	-11.5915	-11.860481	-191.88	-313.71	-190.51	-37.4166	9962.33	-22.8858	-311.471	154030	12.1105	2.89	
4	2	574.57	395.08	5.74	15499.2	-10.4758	-10.744774	-175.88	-212.89	-174.625	-25.3917	9934.42	-20.9774	-211.37	154129	13.2262	3.3489	
5	3	731.48	324.47	5.4	57938	-11.9074	-12.176409	-18.97	-283.5	-18.8346	-33.8134	9787.05	-2.26258	-281.476	154040	11.7946	2.2201	
6	4	850.84	351.98	5.41	79406.3	-12.2496	-12.518637	100.39	-255.99	99.67339	-30.5323	9665.26	11.9736	-254.163	154053	11.4524	2.25	
7	5	662.56	429.79	5.71	604069	-14.4527	-14.721716	-87.89	-178.18	-87.2626	-21.2518	9842.91	-10.4828	-176.908	154153	9.24928	3.24	
8	6	790.17	454.34	5.03	230144	-13.405	-13.673998	39.72	-153.63	39.43647	-18.3237	9713.29	4.73746	-152.533	154162	10.297	1.2544	
9	7	949.25	377.58	5.44	34264.7	-11.3371	-11.606116	198.8	-230.39	197.3809	-27.4789	9564.5	23.7111	-228.745	154067	12.3649	2.3409	
10	8	943.6	487.04	5.38	487999	-14.221	-14.490047	193.15	-120.93	191.7712	-14.4235	9557.05	23.0373	-120.067	154176	9.48095	2.1609	
11	9	912.35	531.28	6.38	1177130	-15.1771	-15.446061	161.9	-76.69	160.7443	-9.14692	9582.8	19.31	-76.1426	154224	8.52494	6.1009	
12	10	757.03	546.73	4.77	155857	-12.9818	-13.250817	6.58	-61.24	6.53303	-7.30418	9735.17	0.78481	-60.8029	154257	10.7202	0.7396	
13	11	750.44	607.97	4.88	583310	-14.4147	-14.683748	-0.01	0	-0.00993	0	9734.41	-0.00119	0	154319	9.28725	0.9409	
14	12	894.28	715.6	5.96	1243215	-15.2364	-15.505366	143.83	107.63	142.8033	12.8372	9578.76	17.1548	106.862	154409	8.46563	4.2025	
15	13	969.27	609.68	4.93	33355.5	-11.3079	-11.57692	218.82	1.71	217.258	0.20395	9516.94	26.0989	1.69779	154295	12.3941	1.0404	
16	14	646.65	341.45	1.52	3171.09	-8.75302	-9.0220211	-103.8	-266.52	-103.059	-31.7882	9869.25	-12.3804	-264.618	154067	14.949	5.7121	
17	15	574.57	395.08	5.74	15499.2	-10.4758	-10.744774	-175.88	-212.89	-174.625	-25.3917	9934.42	-20.9774	-211.37	154129	13.2262	3.3489	
18	16	650.59	661.49	4.32	12070.6	-10.2043	-10.473324	-99.86	53.52	-99.1472	6.3834	9827.16	-11.9104	53.138	154384	13.4977	0.1681	
19	17	748.67	675.44	1.6	3480.43	-8.85408	-9.1230826	-1.78	67.47	-1.76729	8.04724	9728.12	-0.2123	66.9884	154386	14.8479	5.3361	
20	18	827.12	682.79	4.32	5189.66	-9.28785	-9.5568475	76.67	74.82	76.12271	8.92388	9649.35	9.14453	74.2859	154384	14.4142	0.1681	
21	19	865.73	652.41	1.73	1096.77	-7.60029	-7.8692859	115.28	44.44	114.4571	5.30042	9614.64	13.7496	44.1228	154349	16.1017	4.7524	
22	20	882.55	575.43	1.33	1287.98	-7.77477	-8.0437711	132.1	-32.54	131.157	-3.88109	9607.12	15.7557	-32.3077	154271	15.9272	6.6564	
23	21	840.68	379.44	1.56	1432.5	-7.89023	-8.1592335	90.23	-228.53	89.58591	-27.2571	9672.07	10.7619	-226.899	154081	15.8118	5.5225	
24	22	768.72	282.43	1.69	3058.83	-8.71389	-8.9828876	18.27	-325.54	18.13958	-38.8276	9755.09	2.17909	-323.216	153994	14.9881	4.9284	
25	23	574.66	604.44	1.56	1079.76	-7.58332	-7.8523151	-175.79	-3.53	-174.535	-0.42103	9909.36	-20.9667	-3.5048	154336	16.1187	5.5225	
26	24	564.63	609.44	1.58	1553.93	-7.97858	-8.2475772	-185.82	1.47	-184.494	0.17533	9918.72	-22.163	1.45951	154343	15.7234	5.4289	
27	25	710.73	611.48	1.64	1087.23	-7.59081	-7.8598066	-39.72	3.51	-39.4365	0.41864	9773.42	-4.73746	3.48494	154327	16.1112	5.1529	
28	26	630.21	538.24	1.79	349.509	-6.35864	-6.6276444	-120.24	-69.73	-119.382	-8.31679	9862.1	-14.3412	-69.2322	154264	17.3434	4.4944	
29	27	757.87	370.53	5.09	3156.55	-8.74803	-9.0170327	7.42	-237.44	7.367034	-28.3198	9755.35	0.88499	-235.745	154082	14.954	1.3924	
30	28	865.44	401.15	5.2	3216.05	-8.76831	-9.0373077	114.99	-206.82	114.1692	-24.6677	9644.9	13.715	-205.344	154100	14.9337	1.6641	
31	29	997.61	449.41	1.49	723.16	-7.14809	-7.4170863	247.16	-158.56	245.3957	-18.9117	9507.92	29.4791	-157.428	154132	16.5539	5.8564	
32	30	982.67	560.63	2.12	477.894	-6.69833	-6.9673299	232.22	-47.34	230.5623	-5.6463	9509.48	27.6972	-47.0021	154244	17.0037	3.2041	
33	31	720.68	748.44	1.57	7794.65	-9.72949	-9.9984913	-29.77	140.47	-29.5575	16.754	9747.2	-3.55071	139.467	154462	13.9725	5.4756	
34	32	656.59	745.46	1.38	1160.93	-7.66201	-7.9310142	-93.86	137.49	-93.19	16.3986	9811.19	-11.1948	136.509	154467	16.04	6.4009	
35	33	568.01	325.36	2.64	691.521	-7.09951	-7.3685141	-182.44	-282.61	-181.138	-33.7073	9949.24	-21.7599	-280.593	154060	16.6025	1.6129	
36	34	949.1	377.15	5.37	33760.5	-11.321	-11.590022	198.65	-230.82	197.232	-27.5302	9564.7	23.6932	-229.172	154066	12.381	2.1316	
37	35	820.35	419.39	18.81	739.664	-7.17259	-7.4415868	69.9	-188.58	69.40103	-22.4922	9687.49	8.33706	-187.234	154123	16.5294	222.01	
38	36	699.97	600.01	1.88	344.43	-6.34275	-6.6117515	-50.48	-7.96	-50.1197	-0.9494	9785.47	-6.02082	-7.90318	154317	17.3592	4.1209	
39	37	652.81	635.4	4.67	1631.73	-8.03162	-8.3006174	-97.64	27.43	-96.943	3.27161	9828.07	-11.6457	27.2342	154358	15.6704	0.5776	
40	38	819.84	603.74	1.85	445.261	-6.62154	-6.8905357	69.39	-4.23	68.89467	-0.50452	9666.01	8.27624	-4.1998	154307	17.0805	4.2436	
41	39	646.65	341.45	1.52	3171.09	-8.75302	-9.0220211	-103.8	-266.52	-103.059	-31.7882	9869.25	-12.3804	-264.618	154067	14.949	5.7121	
42	40	939.84	427.44	1.8	718.848	-7.14159	-7.4105925	189.39	-180.53	188.0381	-21.532	9567.89	22.5888	-179.241	154117	16.5604	4.4521	
43		**Mean FWHM =**		3.91025												**Mean**	8.96939	
44																**Uncertainty**		2.99489
45																		
46																		

Fig 9: Stars instrumental magnitude in B-filter

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	**G-FILTER**		Centroids = (x,y)			AC= Aperture Correction = 0.432				A=(721.69,609.49)								
2	**STARS**	**X**	**Y**	**FWHM**	**Flux(5)**	**m(flux)**	**m(flux) - AC**	**dx**	**dy**	**dx*cos(T)**	**dy*sin(T)**	**RA**	**dx*sin(T)**	**dy*cos(T)**	**Dec**	**m(inst)**	**(x-mean)^2**	
3	1	671.5	330.2	5	37447.76	-11.4336	-11.8655646	-50.19	-279.29	-46.7436	-101.709	9882.853	-18.2777	-94.7249	154242.6	11.79544	0.0324	
4	2	793.23	344.69	5	43399.8	-11.5937	-12.0257193	71.54	-264.8	66.62753	-96.4322	9764.205	26.05271	-89.8104	154203.1	11.63528	0.0324	
5	3	894.15	359.62	5.85	23964.96	-10.9489	-11.3809418	172.46	-249.87	160.6176	-90.9951	9664.777	62.80472	-84.7467	154171.4	12.28006	0.4489	
6	4	812.18	391.94	4.47	3551.959	-8.87617	-9.30816986	90.49	-217.55	84.27628	-79.2251	9729.349	32.95372	-73.785	154212.3	14.35283	0.5041	
7	5	524.52	416.78	7.34	16403.45	-10.5373	-10.969338	-197.17	-192.71	-183.631	-70.1792	9988.21	-71.8034	-65.3601	154325.4	12.69166	4.6656	
8	6	614.62	442.21	5.89	310485.2	-13.7301	-14.1621023	-107.07	-167.28	-99.7178	-60.9183	9895.036	-38.9917	-56.7352	154301.3	9.498898	0.5041	
9	7	744.82	452.59	6.13	132021.3	-12.8016	-13.23361	23.13	-156.9	21.54172	-57.1382	9769.997	8.423247	-53.2147	154257.4	10.42739	0.9025	
10	8	781.36	459.3	2.35	2253.578	-8.38218	-8.81418149	59.67	-150.19	55.57261	-54.6947	9733.522	21.73001	-50.9389	154246.3	14.84682	8.0089	
11	9	900.66	468.9	6.27	269273	-13.5755	-14.007482	178.97	-140.59	166.6806	-51.1986	9618.918	65.17547	-47.683	154206.1	9.653518	1.1881	
12	10	874.32	515.82	6.8	786135.1	-14.7387	-15.170743	152.63	-93.67	142.1493	-34.1118	9626.362	55.58324	-31.7694	154231.6	8.490257	2.6244	
13	11	721.8	547.98	6	100803.6	-12.5087	-12.9406901	0.11	-61.51	0.102447	-22.4001	9756.698	0.040059	-20.8619	154298.1	10.72031	0.6724	
14	12	939.62	588.31	5.73	32895.39	-11.2928	-11.7248376	217.93	-21.18	202.9653	-7.71312	9539.148	79.36352	-7.18348	154232.5	11.93616	0.3025	
15	13	876.07	701.03	5.12	840394	-14.8112	-15.2432074	154.38	91.54	143.7791	33.3361	9557.285	56.22053	31.047	154293.8	8.417793	0.0036	
16	14	984.53	747.02	4.33	41487.52	-11.5448	-11.9767937	262.84	137.53	244.7915	50.08427	9439.524	95.71839	46.64511	154269.9	11.68421	0.7225	
17	15	806.07	675.69	4.41	6305.443	-9.49929	-9.93128901	84.38	66.2	78.58584	24.10804	9631.706	30.72865	22.4526	154310.7	13.72971	0.5929	
18	16	628.13	673.55	5.04	11337.72	-10.1363	-10.5683143	-93.56	64.06	-87.1355	23.32872	9798.207	-34.0717	21.72679	154374.8	13.09269	0.0196	
19	17	706.21	749.16	2.74	8149.012	-9.77776	-10.2097624	-15.48	139.67	-14.417	50.86359	9697.953	-5.63735	47.37092	154372	13.45124	5.9536	
20	18	524.59	416.48	7.51	17202.23	-10.589	-11.0209619	-197.1	-193.01	-183.566	-70.2884	9988.254	-71.7779	-65.4619	154325.3	12.64004	5.4289	
21	19	754.34	283.14	2.47	3620.52	-8.89693	-9.32892738	32.65	-326.35	30.40801	-118.847	9822.839	11.89014	-110.686	154196.4	14.33207	7.3441	
22			**Mean FWHM**		5.181579											**Mean**	2.102711	
23																**Uncertainty**		1.45007
24																		
25																		

Fig 10: Stars instrumental magnitude in G filter

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	**R-FILTER**			Centroids = (x,y)			AC= Aperture Correction=0.263				A=(700.80,620.64)							
2	**STARS**	**X**	**Y**	**FWHM**	**Flux(5)**	**m(flux)**	**m(flux) - AC**	**dx**	**dy**	**dx*cos(T)**	**dy*sin(T)**	**RA**	**dx*sin(T)**	**dy*cos(T)**	**Dec**	**m(inst)**	**(x-mean)^2**	
3	1	611.21	351.9	5.55	69542.4	-12.1056	-12.368624	-89.59	-268.74	33.95827	-248.687	9949.128	-82.9048	101.8634	154503.8	11.78138	0.1296	
4	2	733.72	348.08	5.44	81023.96	-12.2715	-12.534534	32.92	-272.56	-12.478	-252.222	9999.1	30.46351	103.3114	154391.8	11.61547	0.0625	
5	3	835.34	348.36	4.57	51785.1	-11.7855	-12.048512	134.54	-272.28	-50.9962	-251.962	10037.36	124.5006	103.2052	154297.7	12.10149	0.3844	
6	4	889.5	356.2	5.49	8392.939	-9.80979	-10.072785	188.7	-264.44	-71.525	-244.707	10050.63	174.6192	100.2336	154244.6	14.07721	0.09	
7	5	863.97	366.65	6.16	8937.317	-9.87802	-10.141018	163.17	-253.99	-61.8481	-235.037	10031.29	150.9942	96.27259	154264.3	14.00898	0.9409	
8	6	760.33	391.92	5.6	11814.8	-10.1811	-10.444066	59.53	-228.72	-22.5643	-211.653	9968.617	55.08787	86.69423	154350.6	13.70593	0.1681	
9	7	743.89	289	2.39	535.3033	-6.8215	-7.0844998	43.09	-331.64	-16.3329	-306.893	10057.63	39.87462	125.7051	154404.8	17.0655	7.84	
10	8	571.23	470.11	7.26	405444.2	-14.0198	-14.282828	-129.57	-150.53	49.11232	-139.297	9824.585	-119.901	57.05702	154496	9.867172	4.2849	
11	9	701.29	462.02	5.84	243292.9	-13.4653	-13.728324	0.49	-158.62	-0.18573	-146.784	9881.369	0.453436	60.12346	154378.7	10.42168	0.4225	
12	10	857.79	455.7	5.08	410889.4	-14.0343	-14.297312	156.99	-164.94	-59.5056	-152.632	9946.538	145.2754	62.519	154236.2	9.852688	0.0121	
13	11	838.11	506.04	6.56	863577.3	-14.8408	-15.103753	137.31	-114.6	-52.0461	-106.049	9892.495	127.0639	43.43808	154235.4	9.046247	1.8769	
14	12	692.27	559.74	5.32	184796.8	-13.1667	-13.429736	-8.53	-60.9	3.233219	-56.3556	9787.522	-7.89349	23.08359	154350	10.72026	0.0169	
15	13	913.5	568.29	4.15	66232.59	-12.0527	-12.315679	212.7	-52.35	-80.622	-48.4436	9863.466	196.8283	19.84279	154142	11.83432	1.0816	
16	14	866.3	689.13	6.53	850969.3	-14.8248	-15.087785	165.5	68.49	-62.7313	63.37927	9733.752	153.1504	-25.9605	154139.9	9.062215	1.7956	
17	15	980.83	718.61	5.62	73855.9	-12.171	-12.433963	280.03	97.97	-106.143	90.65947	9749.883	259.1341	-37.1346	154022.7	11.71604	0.1849	
18	16	918.85	764.04	5.7	647258.6	-14.5277	-14.790695	218.05	143.4	-82.6499	132.6995	9684.35	201.7791	-54.3545	154062.9	9.359305	0.2601	
19	17	695.81	754.45	1.44	9753.034	-9.97285	-10.235849	-4.99	133.81	1.891414	123.8251	9608.683	-4.61765	-50.7195	154272.9	13.91415	14.0625	
20	18	617.45	697.83	5.98	23451.08	-10.9254	-11.188407	-83.35	77.19	31.59306	71.43008	9631.377	-77.1304	-29.2582	154366.9	12.96159	0.6241	
21	19	793.75	673.96	4	13809.62	-10.3505	-10.613454	92.95	53.32	-35.2318	49.34126	9720.291	86.01407	-20.2105	154212.8	13.53655	1.4161	
22			**Mean FWHM**		5.193684											**Mean**	1.876511	
23																**Uncertainty**		1.369858
24																		

Fig 11: Stars instrumental magnitude in R filter

BIBLIOGRAPHY

2000, 2001, 2002, 2007, 2008 Free Software Foundation, Inc.

https://fsf.org/

Nasa

http://apod.nasa.gov/

APPENDICES

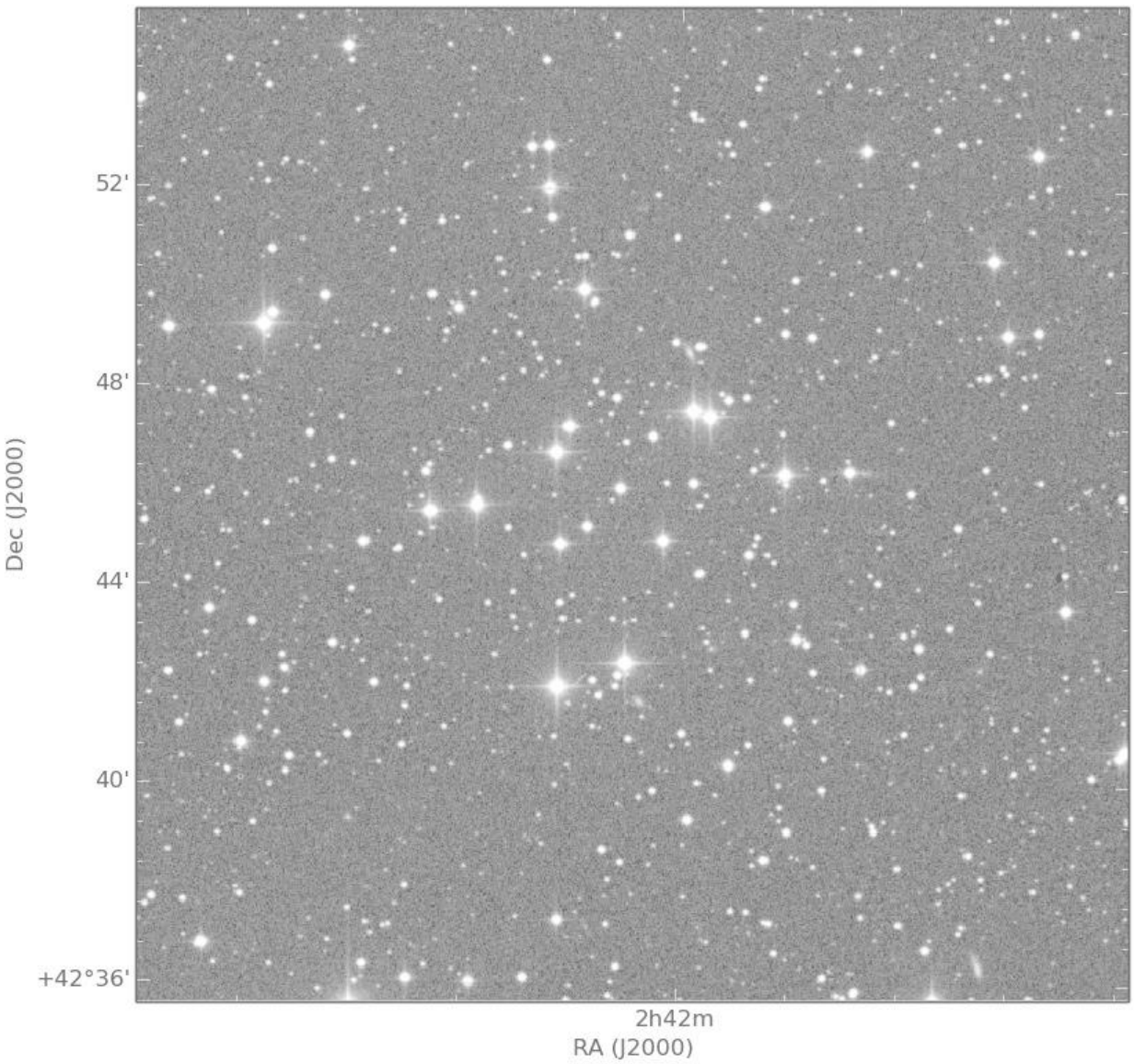


Fig 12: M34 Finding Chart

M34 IMAGES:

(a) B-Filter

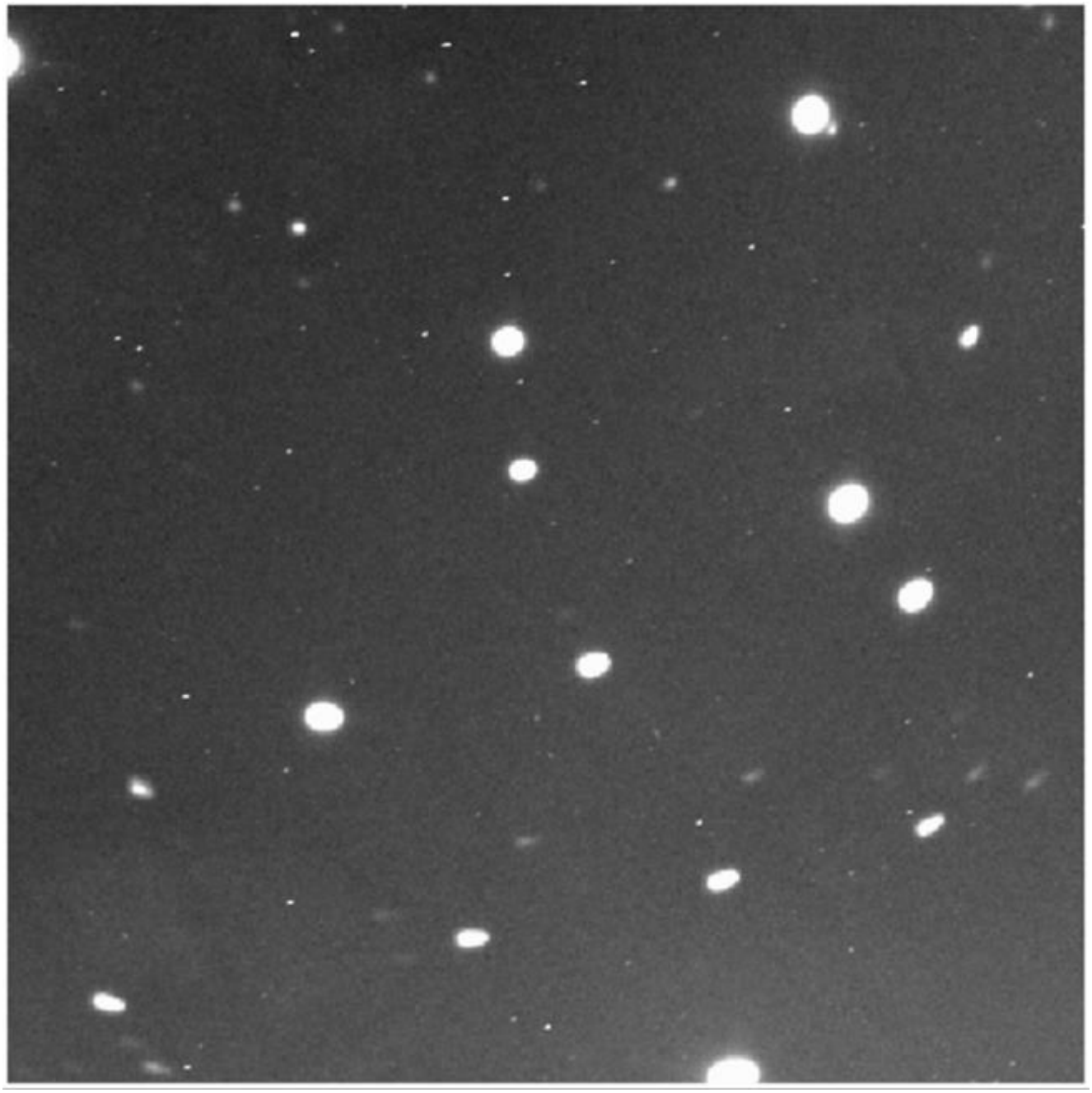


Fig 13: B-Filter Combined image

(b) G-Filter

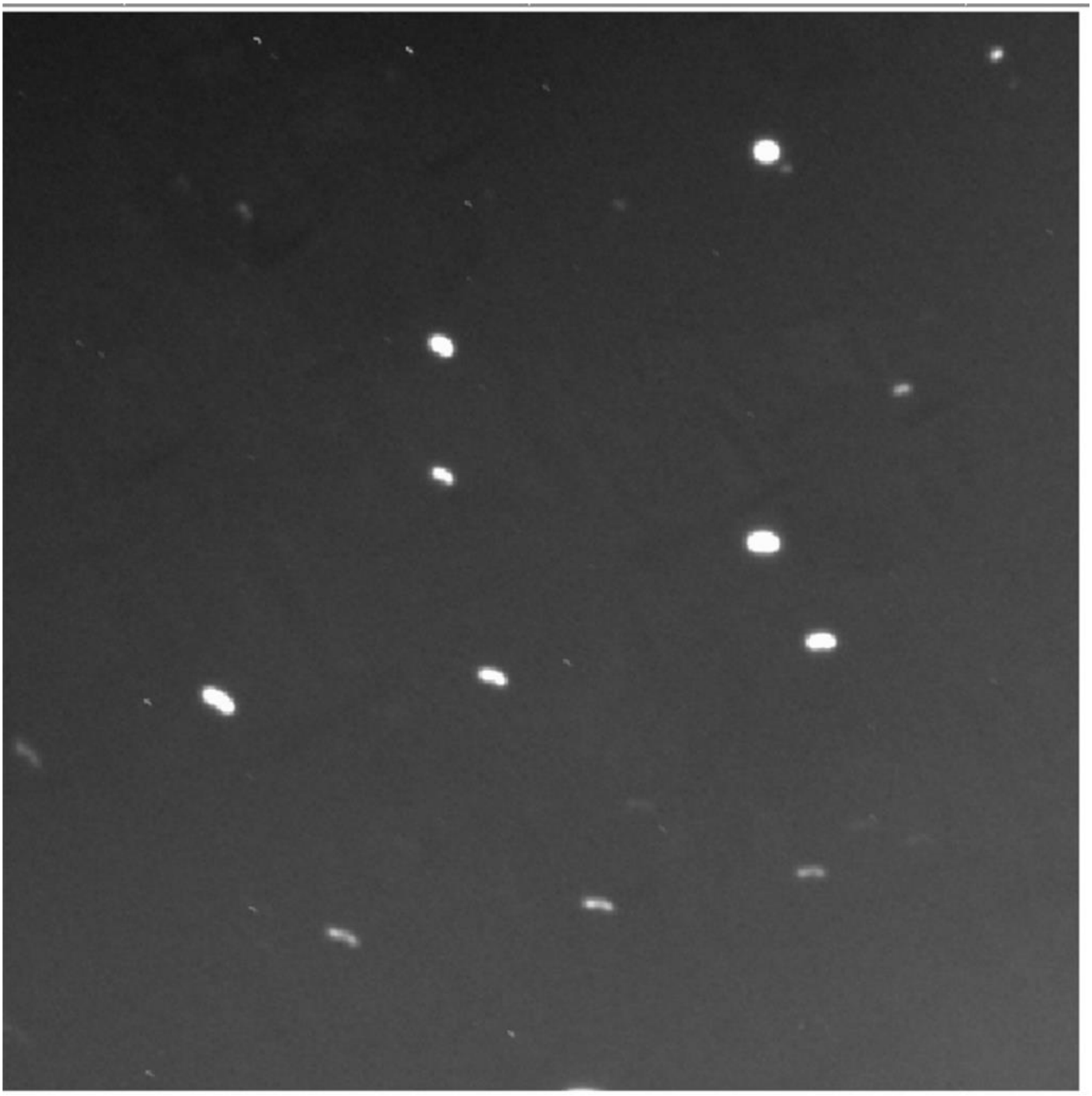


Fig 14: G-Filter combined image

(c) R-Filter

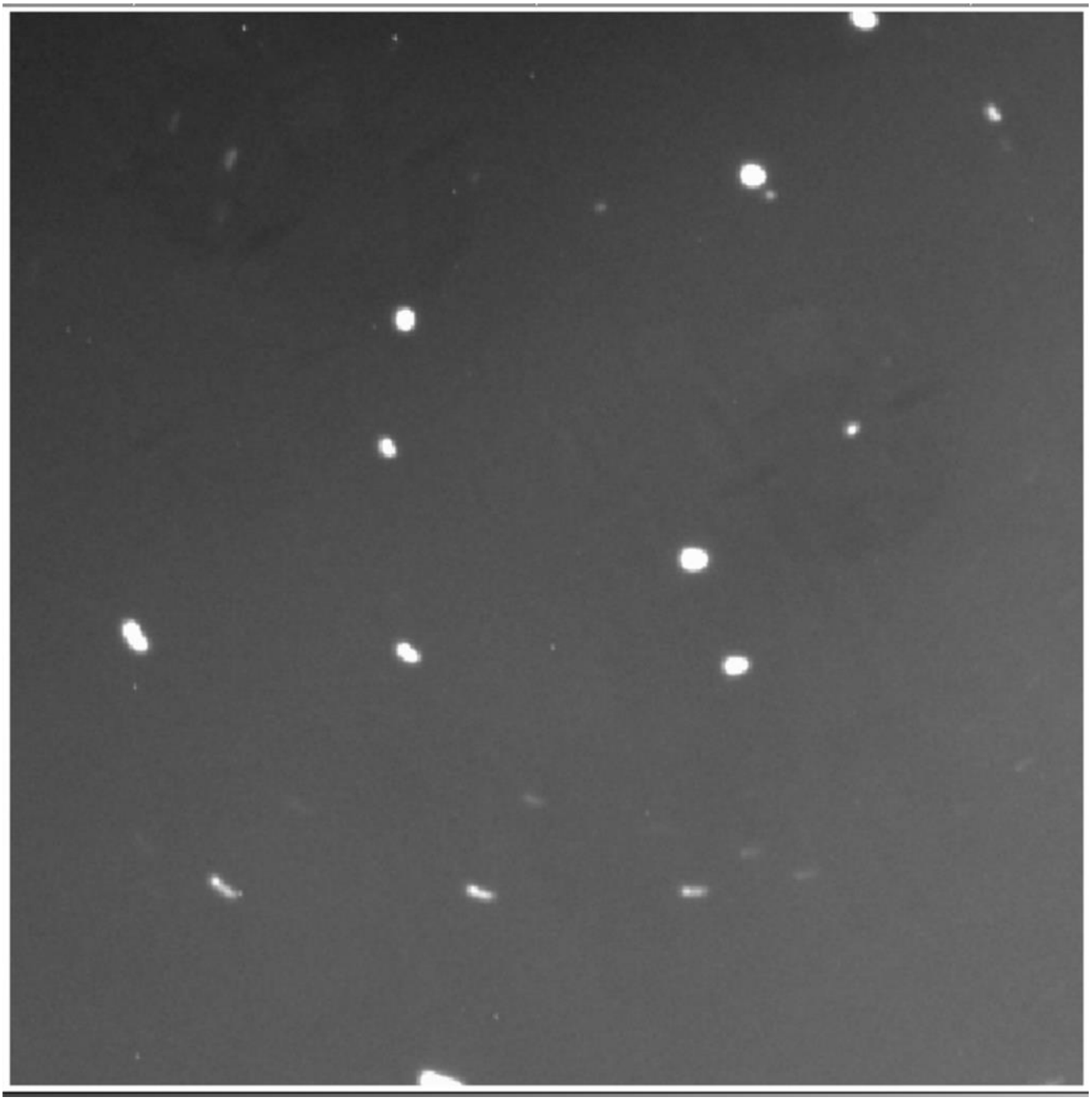
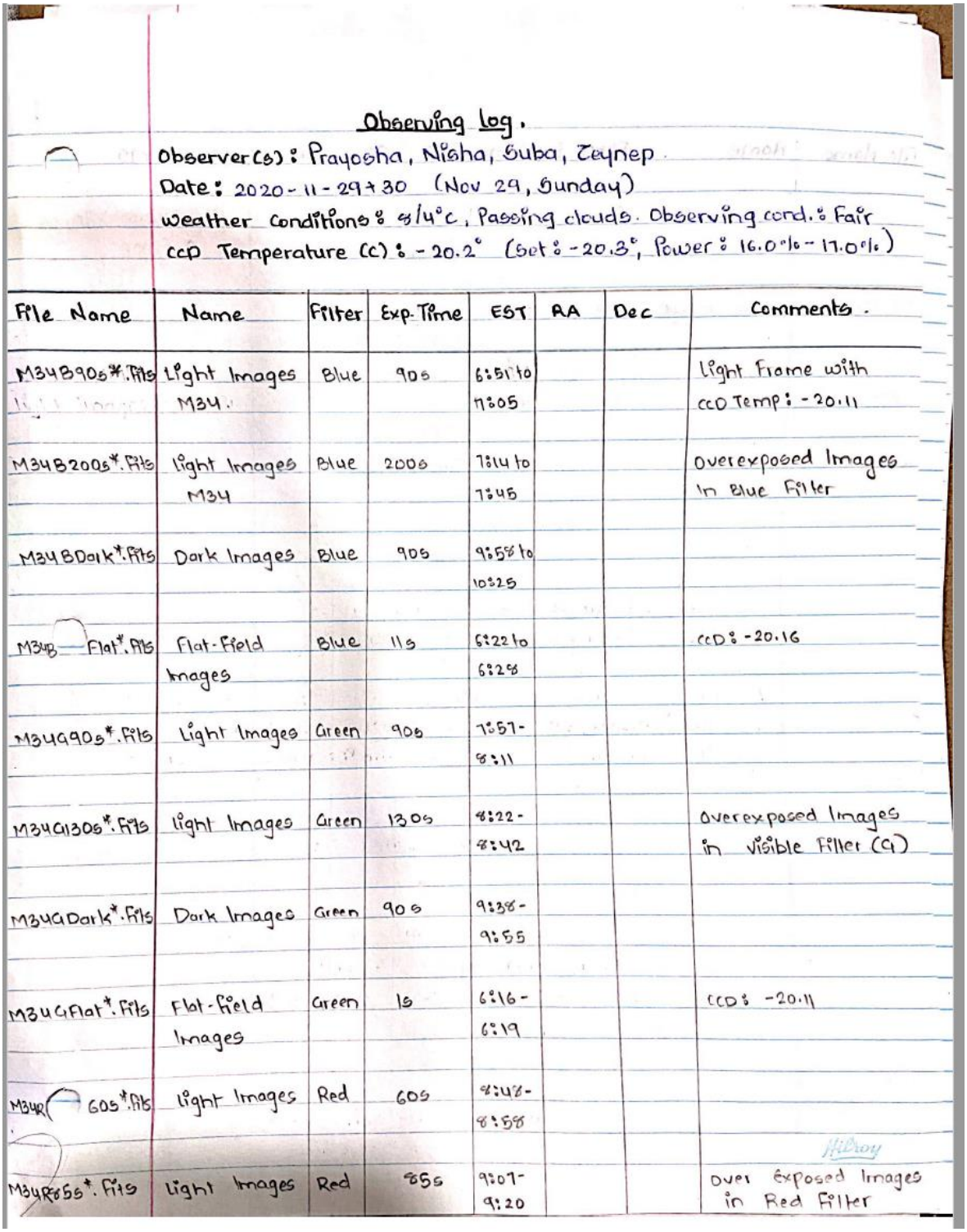


Fig 15: R-Filter combined image

Observing Log:



Observing Log.

Observer(s): Prayosha, Nisha, Suba, Zeynep

Date: 2020-11-29+30 (Nov 29, Sunday)

Weather conditions: 8/4°C, Passing clouds. Observing cond.: Fair

CCD Temperature (C): -20.2° (Set: -20.3°, Power: 16.0%-17.0%)

File Name	Name	Filter	Exp. Time	EST	RA	Dec	Comments.
M34B90s*.fits	Light Images M34.	Blue	90s	6:51 to 7:05			Light Frame with CCD Temp: -20.11
M34B200s*.fits	light Images M34	Blue	200s	7:14 to 7:45			Overexposed Images in Blue Filter
M34BDark*.fits	Dark Images	Blue	90s	9:58 to 10:25			
M34B Flat*.fits	Flat-Field Images	Blue	11s	6:22 to 6:28			CCD: -20.16
M34G90s*.fits	Light Images	Green	90s	7:57-8:11			
M34G130s*.fits	light Images	Green	130s	8:22-8:42			Overexposed Images in visible filter (G)
M34GDark*.fits	Dark Images	Green	90s	9:38-9:55			
M34GFlat*.fits	Flat-field Images	Green	1s	6:16-6:19			CCD: -20.11
M34R 60s*.fits	light Images	Red	60s	8:48-8:58			
M34R855*.fits	Light Images	Red	855	9:07-9:20			Over Exposed Images in Red Filter

File Name	Name	Filter	Exp. Time	EST	RA	Dec	Comments
M34RBias*.fits	Bias Images	Red	0s	6:29-6:31			Bias frames in R filter.
M34RDark*.fits	Dark Images	Red	85s	9:23-9:35			
M34RFlat*.fits	Flat-field Images	Red	0.5s	6:13-6:15			CCD: -20.17