CCD Measurements of Double Stars in the Vicinity of The Blue Snowball

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Abstract: The measurements of approximately 50 double stars within a few degrees of NGC 7662 are reported. These measurements were made with a CCD camera and Schmidt-Cassegrain Telescopes of 8 inches and 11 inches. Precision of the measurements of Theta and Rho are given along with the positions of the primaries. A short discussion of the methodology used is included.

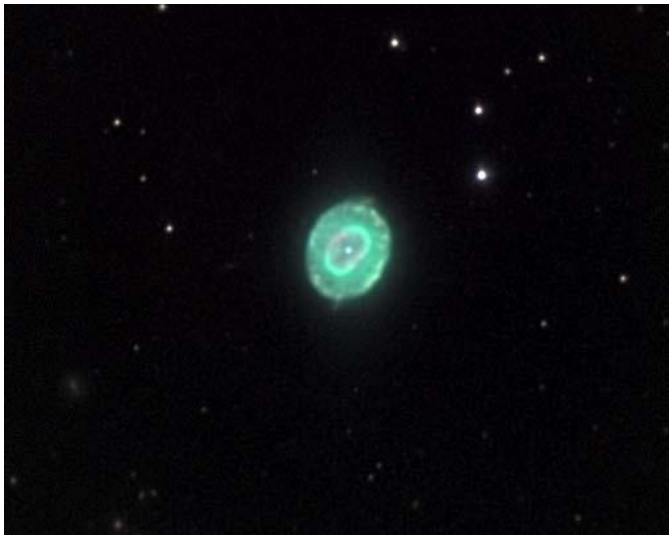
This paper reports on observations and measurements of double stars that lie within a few degrees of NGC 7662. Observations were made using an 8-inch (20 cm) f/10 SCT and an 11-inch (28 cm) f/10 SCT. A Meade f/6.3 focal reducer/field flattener was used on the 11-inch SCT. Notes indicate which telescope was used.

The bulk of the observations were made after October 2002 and were made with a SBIG ST7 CCD camera with a KAF401E non anti-blooming (NAB) sensor. The few observations made before October 2002 were made with a Genesis 15 CCD camera utilizing a similar KAF401E NAB sensor.

The Blue Snowball has long been one of my favorite objects and I don't miss many opportunities to sneak a peak at it. However, being a double star observer, I couldn't help but notice the fine 3-star system (HJ 1877) just to the NE of NGC 7662 and the fairly large number of doubles grouped around NGC 7662 that seem to invite attention.

Finding and measuring "clusters" or groups of doubles is appealing to me because of the efficiency that they offer. There is no need to make large telescope movements to move to the next target. Since most of the doubles in these clusters are frequently discovered by the same observer, it also gives me a feeling of following in the foot steps of an observer who has gone before. Almost all of the doubles included in this paper were discovered by P. S. Chevalier in 1911.

In almost all cases, 20 images were taken of each double in an observing session. Five to ten images were selected from the original 20 based on their "roundness" as measured by the Star Image Tool of Richard Berry and James Brunell's "AIP for Windows" program. The selected images were solved using Herman Rabb's "Astrometrica" program and the UCAC-2 catalog. I find that the pre-selection of images helps eliminate images that might have been degraded by seeing or drive tracking. The precision of each observation was quantified by calculating the standard deviation of its image set.



Adam Block/NOAO/AURA/NSF
The Blue Snowball Nebula

Che 458 (WDS: 23260+4201) appears to be composed of GSC3238.328 and GSC3238.254. This is based on

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the Precise Coordinate of 2325600+420050 from the current WDS catalog. Without the benefit of the Precise Coordinate I would have selected the brighter pair GSC3238.304 and GSC3228.476 at 232554.38+420028.5 (USN0-B1.0).

Che 471AB has been measured 4 times since its discovery in 1911. Three measurements were made between 1969 and 1989. These measurements varied between 7.40" and 7.45" for separation and 106.1 degrees and 104.8 degrees for PA. The last measurement (1991) made from TYC2000b data was 5.326" and 116.6 degrees. My measurement (7.48, 104.1) was consistent with the previous three measurements.

In order to aid anyone who wishes to reproduce one or more of my observations and to remove any ambiguity regarding which stars I observed, I have included my measured position of the primary in the notes.

Observations made in different observing seasons are reported as separate observations.

NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
Che 436	23218+4226	10.25,10.99	336.7	30.00	2003.633	1	1
Che 437AB	23223+4204	10.71,10.82	187.5	31.46	2003.633	1	2
Che 437AC	23223+4204	10.71,10.96	45.4	21.41	2003.633	1	3
Che 440	23226+4150	9.49,10.78	125.5	27.22	2004.584	1	4
Che 441	23227+4255	10.01,10.63	41.3	49.60	2004.584	1	5
Che 444	23230+4218	10.35,11.04	150.1	36.42	2002.811	1	6
Che 444	23230+4218	10.35,11.04	150.0	36.42	2004.584	1	7
Che 445	23234+4248	9.69,10.56	253.7	31.32	2002.803	2	8
Che 446	23234+4234	10.64,10.93	191.5	14.97	2002.811	1	9
Che 446	23234+4234	10.64,10.93	191.7	14.99	2004.622	1	10
Che 449	23244+4221	10.86,10.95	33.2	29.38	2003.701	2	11
Che 450 AB	23245+4223	10.84,10.88	335.1	12.04	2003.701	2	12
Che 450 AB	23245+4223	10.84,10.88	335.1	12.03	2004.584	1	13
Che 450 AC	23245+4223	10.84,11.20	26.2	21.04	2003.701	2	14
Che 450 AC	23245+4223	10.84,11.20	26.2	21.08	2004.584	1	15
Che 453 AB	23249+4149	9.69,10.70	34.2	39.21	2003.658	1	16
Che 455	23250+4220	10.85,10.97	302.8	28.95	2003.679	1	17
Che 457	23259+4241	11.60,12.15	120.8	17.32	2003.622	1	18
Che 458	23260+4201	10.71,10.96	262.3	30.15	2003.658	1	19
Che 459	23261+4203	10.35,10.98	4.9	28.08	2003.658	1	20
Che 464	23265+4212	10.30, 11.0	120.3	9.94	2004.584	1	21
Che 466	23268+4157	9.73, 10.30	124.6	19.33	2003.658	1	22
Che 468	23271+4201	8.13, 11.08	85.3	16.88	2004.584	1	23
Che 469	23271+4143	10.65,10.99	66.0	17.71	2003.658	1	24
Che 470	23272+4224	10.33,10.7	203.5	32.00	2003.632	2	25
Che 472	23276+4248	9.44, 10.16	223.9	23.26	2003.581	1	26
Che 473	23276+4227	10.79,10.90	312.7	29.31	2003.630	2	27
Che 476	23278+4244	9.67,10.05	88.4	8.97	2003.581	2	28
Che 476	23278+4244	9.67,10.05	88.9	8.89	2004.584	1	29
Che 477	23278+4218	10.57,10.96	230.1	39.38	2003.638	3	30

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NAME	RA DEC	MAGS	PA	SEP	DATE	N	NOTES
Che 480	23279+4201	9.74,10.15	148.4	36.92	2003.657	2	31
Che 482	23280+4216	10.79,10.98	342.3	30.20	2003.602	2	32
Che 483	23281+4213	10.83,11.07	39.1	14.71	2003.622	1	33
Che 484	23282+4245	9.60,10.57	87.5	27.94	2004.629	1	34
Che 485	23283+4316	10.08,10.76	171.8	21.94	2003.723	1	35
Che 486	23283+4238	10.68,11.01	318.9	33.24	3004.646	1	36
Che 487	23284+4155	10.51,10.83	229.1	41.46	2004.653	1	37
Che 488	23285+4230	10.26,10.92	26.1	34.30	2003.655	1	38
Che 490	23288+4227	10.11,10.37	16.6	31.49	2003.655	1	39
Che 491 AB	23288+4154	10.33,10.82	54.1	35.98	2003.658	1	40
Che 491 AC	23288+4154	10.33,10.89	240.9	35.60	2003.658	1	41
Che 492	23288+4144	9.73,10.30	66.7	18.78	2003.658	1	42
Che 493	23289+4230	10.49,10.63	23.4	32.27	2003.655	1	43
Che 494 AB	23290+4245	9.43,10.55	203.1	25.40	2003.581	1	44
Che 494 AC	23290+4245	9.43, 10.83	181.0	10.91	2003.581	1	45
Che 495	23292+4212	10.33,11.00	72.5	14.02	2003.622	1	46
Che 496	23293+4248	10.47,10.89	152.5	34.15	2003.581	1	47
Che 499	23297+4206	10.70,10.75	183.3	27.37	2003.622	1	48
Che 501	23301+4215	10.56,10.68	272.3	24.55	2003.622	1	49
Chef 502	23303+4239	9.82,10.48	19.4	11.65	2003.618	2	50
Che 503	23304+4238	10.54,10.72	353.3	25.68	2003.618	2	51
Hj 1877 AB	23259+4232	12.2,14.10	357.7	20.23	2002.795	1	52
Hj 1877 AB	23259+4232	12.2,14.10	357.9	20.28	2003.634	1	53
Hj 1864	23169+4238	9.79,10.35	205.8	22.86	2004.584	1	54
Hj 1876	23259+2651	11.1, 11.6	211.0	9.30	2004.585	1	55
Hj 1882	23278+3924	9.5, 13.6	332.7	13.79	2004.340	1	56
Ali 1184	23160+4014	12.1, 12.4	50.5	9.40	2004.325	1	57
Che 471 AB	23274+4140	12.36, 12.59	104.1	7.48	2004.584	1	58
Che 471 AC	23274+4140	12.36, 13.0	329.1	12.53	2004.584	1	59

Notes: Object, Measured Position, Separation Standard Deviation, PA Standard Deviation, Aperture

1. Che 436, 2321467+422549, 0.04, 0.07, 20 cm
2. Che 437AB, 2322148+420334, 0.03, 0.06, 20 cm
3. Che 437AC, 2322148+420334, 0.02, 0.09, 20 cm
4. Che 440, 2322348+415001, 0.05, 0.08, 28 cm
5. Che 440, 2322394+425455, 0.03, 0.02,28 cm
6. Che 444, 2322560+421809, 0.09, 0.15, 20 cm
7. Che 444, 2322560+421809, 0.04, 0.04, 28 cm
8. Che 445, 2323216+424734, 0.08, 0.06, 20 cm
9. Che 446, 2323239+423414, 0.11, 0.31, 20 cm
10. Che 446, 2323239+423414, 0.03, 0.06, 28 cm
11. Che 449, 2324213+422109, 0.07, 0.07, 20 cm
12. Che 450AB, 2324308+422251, 0.03, 0.11, 20 cm
13. Che 450AB, 2324308+422251, 0.03, 0.12, 28 cm
14. Che 450AC, 2324308+422251, 0.04, 0.07, 20 cm
15. Che 450AC, 2324308+422251, 0.06, 0.07, 28 cm
16. Che 453AB, 2324553+414858, 0.05, 0.08, 20 cm
17. Che 455, 2325016+422006, 0.06, 0.08, 20 cm
18. Che 457, 2325553+424050, 0.03, 0.07, 20 cm
19. Che 458, 2325544+420028, 0.07, 0.12, 20 cm
20. Che 459, 2326054+420322, 0.12, 0.13, 20 cm
21. Che 464, 2326325+421207, 0.05, 0.21, 28 cm
22. Che 466, 2326510+415701, 0.03, 0.09, 20 cm
23. Che 468, 2327038+420052, 0.03, 0.11, 28 cm
24. Che 469, 2327091+414329, 0.05, 0.23, 20 cm
25. Che 470, 2327098+422400, 0.04, 0.04, 20 cm
26. Che 472, 2327371+424829, 0.02, 0.04, 20 cm
27. Che 473, 2327375+422637, 0.04, 0.04, 20 cm
28. Che 476, 2327484+424334, 0.04, 0.19, 20 cm
29. Che 476, 2327484+424334, 0.01, 0.09, 28 cm
30. Che 477, 2327522+421830, 0.06, 0.06, 20 cm
31. Che 480, 2327559+420101, 0.04, 0.07, 20 cm
32. Che 482, 2327597+421621, 0.07, 0.11, 20 cm
33. Che 483, 2328089+421325, 0.04, 0.11, 20 cm
34. Che 484, 2328144+424448, 0.03, 0.06, 28 cm

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35. Che 485, 2328144+424447, 0.04, 0.08, 20 cm
36. Che 486, 2328187+423800, 0.04, 0.06, 28 cm
37. Che 487, 2328241+415525, 0.02, 0.03, 28 cm
38. Che 488, 2328327+422952, 0.04, 0.10, 20 cm
39. Che 490, 2328517+422717, 0.05, 0.03, 20 cm
40. Che 491AB, 2328518+415430, 0.09, 0.16, 20 cm
41. Che 491AC, 2328518+415430, 0.08, 0.17, 20 cm
42. Che 492, 2328489+414430, 0.10, 0.14, 20 cm
43. Che 493, 2328560+423028, 0.06, 0.19, 20 cm
44. Che 494AB, 2329043+424510, 0.08, 0.21, 20 cm
45. Che 494AC, 2329043+424510, 0.03, 0.04, 20 cm
46. Che 495, 2329140+421144, 0.06, 0.08, 20 cm
47. Che 496, 2329167+424746, 0.05, 0.20, 20 cm
48. Che 499, 2329449+420533, 0.06, 0.15, 20 cm
49. Che 501, 2330113+421440, 0.08, 0.18, 20 cm
50. Che 502, 2329449+420533, 0.02, 0.02, 20 cm
51. Che 503, 2330264+423812, 0.03, 0.10, 20 cm
52. HJ 1877AB, 2325579+423229, 0.03, 0.17, 20 cm
53. Hj 1877AB, 2325579+423229, 0.04, 0.08, 20 cm
54. Hj 1864, 2325589+423229, 0.04, 0.09, 28 cm
55. Hj 1876, 2325589+423229, 0.01, 0.07, 28 cm
56. Hj 1882, 2317005+423747, 0.03, 0.06, 28 cm
57. Ali 1184, 2325568+365033, 0.02, 0.10, 28 cm
58. Che 471AB, 2327261+413937, 0.02, 0.09, 28 cm
59. Che 471 AB. 2327261+413937, 0.02, 0.06, 28 cm

Mr Jones is a retired electrical engineer who lives in Lake Oswego, Or. He has been a double star observer for 6 years and is an occasional contributor to the LIDA group. He also makes photometric observations for the AAVSO.