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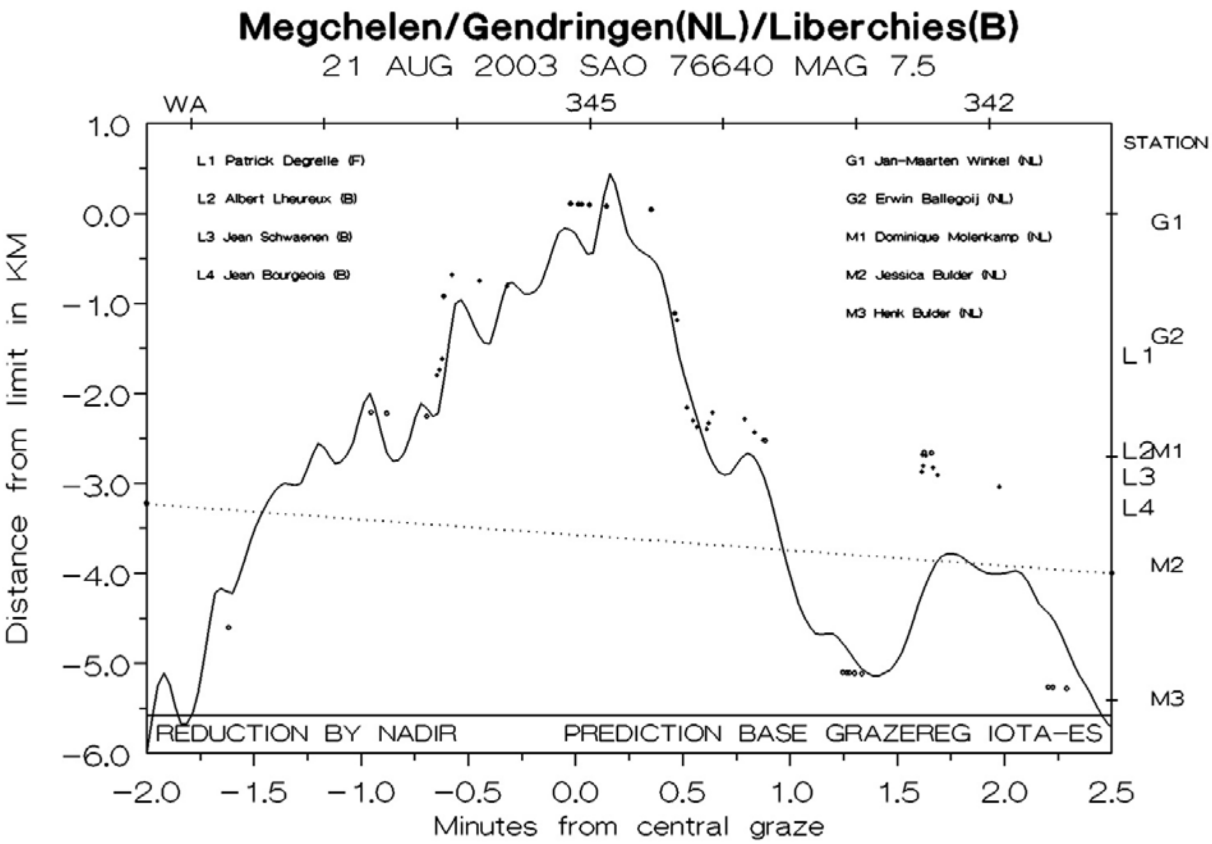

Reduction Profile of the 2003 August 21 Graze of SAO 76640

In this Issue

ON THE COVER:

Reduction profile of the 2003 August 21 graze of SAO 76640.
Graphic courtesy of Henk Bulder.

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Please note: The date shown on the cover is for subscription purposes only and does not reflect the actual publication date.

The next issue, Volume 10, Number 2 will be published in late October. Please send submissions for that issue to on_editor@isdn.datapacket.net **no later than 21 October 2003.**

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Some Sensitivity Characteristics of the Watec 902K Videocamera

Roger Venable

Introduction

A new generation of supersensitive black-and-white videocameras has been available for about two years. The most widely used among occultation observers are the Supercircuits PC164C and the Watec 902H, each of which is rated at 0.0003 lux with an f/1.4 lens. These cameras make possible the videotaping of faint lunar and asteroidal occultations that heretofore could only be observed visually with amateur-sized telescopes. Messages among the IOTA occultations E-mail group (http://groups.yahoo.com/group/IOTAoccultations) have attested to the ease of recording stars of 11th magnitude, while discussions of these cameras in Sky and Telescope magazine have shown poor consensus on just how sensitive these cameras are (1,2). The present article is a qualitative description and semi-quantitative measurement of the sensitivity of one of the cameras of this generation, the Watec 902K, with regard to the recording of faint stars.

Equipment and methods

The videocameras.

The Watec 902K camera was purchased in 2002 from Rock House Products International, Inc., in Middletown, NY, USA. A black and white camera powered by 12-volt DC, it is very similar to Watec models 902H and 902HS but with more adjustments of its exposure parameters. It has automatic gain control (AGC) of two types, "high" and "low", reflecting the amount of gain, each of which can be switched on or off. Automatic versus manual exposure control is selectable, and when in the manual mode it has selectable electronic shutter settings from 1/60 second to 1/100000 second. The gamma can be set to any of three settings, which are 0.45, 0.6, and 1.0. The pixels are 8.4 micrometers in horizontal dimension and 9.8 micrometers in vertical dimension. The CCD chip is of "1/2-inch" size, which, in accordance with international standards, is not 1/2 inch across, but rather 8 mm across the diagonal (nearly 0.25-inch in the long dimension of its rectangular shape). The camera is rated to resolve 570 lines horizontally, but resolution is diminished by the use of high gain. The rated sensitivity is 0.00015 lux with the high AGC on, and one-tenth that (0.0015 lux) with the low AGC on, using a lens of f/1.4 (3).

For comparison, a PC-23C camera was also tested, as a representative of the previous generation of videocameras. It was purchased in 2000 from Supercircuits, in Liberty Hill, TX, USA. It, too, is a black and white camera powered by 12-volt DC, but its pixels are approximately 10 mcm in horizontal dimension by 7.5 mcm in vertical dimension. Its CCD chip is of "1/3-inch" size, which is about 6 mm across the diagonal. It is rated at .04 lux sensitivity when used with a lens of f/1.8, and at 460 lines horizontal resolution though the use of gain reduces the resolution. The AGC is the only adjustment that can be made on this camera, and it was used at maximum sensitivity.

Other equipment.

Video images were obtained through a Celestron C11, which is a Schmidt-Cassegrain telescope of 280 mm aperture and 2800 mm focal length. Focal reducers designed to change the focal ratio to f/6.3 and to f/3.3 were used sequentially. To record the images, a DC-powered, VHS-standard video cassette recorder and black and white television were used. A field-advance video cassette recorder and color television were used later to review the resulting videotape.

The observations.

Video recording of M11 in Scutum and M7 in Scorpius were made on the night of June 15-16, 2002, during a period of 32 minutes beginning at 05:12 U.T., which was 20 minutes after moonset. M11 is composed mostly of stars of spectral classes A and F, while M7 stars are mostly classes B and A (4). M11 was at 45 degrees altitude for the f/10 recording, 47 degrees for the f/6.3 recording, and 48 degrees for the f/3.3 recording. M7 was recorded at f/3.3 at an altitude of 22 degrees. A dark-sky site near Windsor, SC, USA, was used, at longitude -81.5429 degrees, latitude +33.4001 degrees, and elevation 107 meters. There were no clouds, and the naked-eye limiting magnitude was estimated to be 6.3. Transparency was good, and seeing was about 5 on the ALPO scale in which 1 is very poor and 10 is perfect. There was no dewing of the optics. The settings of the camera were tweaked during recording, and the television settings were adjusted during playback, to maximize the visibility of faint stars.

To compare the Watec 902K camera with the previous generation of videocameras, the PC-23C camera was used to record NGC 884 in Perseus at f/3.3 for a few minutes around 03:10 UT on February 2, 2003. This observation was made from a site at longitude -82.5249 degrees, latitude +33.1597 degrees, and elevation 132 meters. The cluster was at an altitude of 43 degrees. The stars of NGC 884 are mostly of spectral classes A and B (4). On this night, the naked eye limiting magnitude was also 6.3, and seeing was also 5 on the ALPO scale. There was no dewing of the optics.

Data analysis.

M11 observations were used to ascertain the limiting magnitudes of the system using the Watec 902K camera. A chart of M11 labelled with the visual magnitudes of the stars was prepared from *Guide 8.0* (5). The visibility of stars on the videotape recording was compared to the magnitudes of the labelled stars on the chart. Three types of limiting magnitude were measured. The first was "standard limiting magnitude." Stars near this limit were seen intermittently or were barely evident. The second was "stable limiting magnitude." This is the limit at which stars were seen stably all the time, with sufficiently ease of detection that, were they to be occulted, the moment of the disappearance could likely be unmistakably discerned on the streaming video. The third was "field-advance limiting magnitude." This is the limit at which stars can be seen on each field as the tape is reviewed field by field, and thus, this is the limit at which high time-resolution video timing can be accomplished. Since there was overlap in magnitudes between stars that met and stars that did not meet each visibility criterion, limiting magnitude was judged to be the star magnitude at which the same number of stars met the visibility criterion as did not meet the criterion. This was repeated for each of the three focal ratios. The judgements on these criteria were necessarily somewhat subjective.

For the PC-23C camera, the same procedure was carried out on the NGC 884 video images. The M7 observation was used to derive the relationship between brightness and image diameter and to document the variation in image size with color index. During playback of the video recording, the video was stopped using the "freeze frame" function, and star image sizes were measured on the television screen using a vernier caliper. Star images were measured to determine their maximum horizontal and vertical extents, and this was repeated on four more frozen video fields, so that ten measurements were obtained on each star. The mean of these measurements was used as the diameter of the star's image. This was done on 17 stars of spectral classes B9, A0, or A1, with magnitudes ranging from 6.0 to 9.0. The same procedure was then done on three of the few stars in M7 that are of spectral class K0 to K5. The measurements were repeated on some of the stars, to confirm consistency of technique through the measuring process. Regression analysis of star image size versus visual magnitude was done with a spreadsheet (6).

Results

The settings on the Watec 902K videocamera.

Setting the low AGC to "on" increased the visibility of faint stars as compared to leaving both AGC's off. Turning on the high AGC caused a dramatic further increase in sensitivity to faint stars. When the high AGC was on, switching the low AGC on or off had no effect. The AGC's continued to function when the electronic shutter was set manually, but the image was fainter due to the shuttering. Setting the gamma to 1.0 made a slight further improvement in star visibility. The image noise was markedly increased by using high AGC and high gamma, but the sensitivity was increased so dramatically that the increased noise did not compromise the visibility of stars.

Tweaking the television.

Varying the picture settings on the television greatly affected the visibility of stars during playback. Stars appeared brighter when contrast was maximized using the "contrast" or "picture" adjustment. The background sky brightness was adjusted using the "brightness" setting. Setting brightness low (dark) detracted from the brightness of stars, while stars remained of approximately unchanged prominence on the screen when brightness was set anywhere in the middle to high range. The most comfortable viewing came from setting brightness in the middle of its range so that the screen was medium gray. Stars were more readily visible when "sharpness" was turned to its lowest possible setting. Increasing "sharpness" increased the contrast in the fine noise on the screen, hiding faint stars.

Limiting magnitudes.

For each focal length, the three types of limiting magnitudes and the arcseconds per pixel are presented in Table 1. The shorter focal lengths were associated with fainter limiting magnitudes, presumably due to concentration of a star's light onto fewer pixels of the CCD chip. Clear differences among the three types of limiting magnitude were evident at each focal length. The f/3.3 arrangement allows occultation work to be done on stars as faint as magnitude 12.7 with the Watec 902K camera, and 11.2 with the PC-23C camera. Using this telescope visually, the author was able to see galaxies between magnitudes 14.5 and 15.0 on this night.

Star image size as a function of magnitude.

The means of the measurements of the sizes of images of stars of spectral classes B9 through A1 are graphed on the ordinate in Figure 1 versus the nominal visual magnitudes taken from *Guide 8.0* on the abscissa. The black rectangles each represent the measurements of a star's image. The graph shows a linear relation between star image diameter and magnitude (r = .95). The thick gray line is the least-squares linear regression line. It has a slope of -0.03434 inches per magnitude. The X intercept is the point of zero image size, and would occur at magnitude 14.6. It represents a limit on the faintness of stars that are detectable.

Star image size as a function of color index.

The three stars of spectral classes K0 to K5 are graphed in Figure 1 as open circles, individually labeled with their spectral classes. The K stars have images no larger than those of the hotter stars of the same visual magnitude.

Table 1

Camera	Nominal f ratio	Measured f ratio	Arcsec per pixel	Standard lim mag	Stable lim mag	Freeze frame lim mag
902K	10	10*	0.54	11.8	11.0	10.7
902K	6.3	6.83	0.79	12.4	11.7	11.5
902K	3.3	3.60	1.50	13.2	12.7	12.1
PC-23C	3.3		1.5	11.7	11.2	10.6

*This f ratio was not measured but was stated by the manufacturer, and the other f ratios were measured in comparison to it.

Discussion

Sensitivity.

This limiting magnitude test displays the remarkable sensitivity of the Watec 902K videocamera as a representative of this new generation of videocameras. The improvement over the previous generation, such as the PC23C videocamera, is 1.5 magnitudes. Nevertheless, the camera's best sensivity is about 1.5 magnitudes less sensitive than the author's eye. The superior utility of these cameras for making observations of occultations lies especially in their ability to bring many more stars into video range. The number of stars increases exponentially with magnitude. Thus there are now many more opportunities to videotape occultations than there were in previous years.

Video noise.

The differences among the three types of limiting magnitude are a manifestation of video noise. When we look at streaming video, noise is masked and signal is relatively accentuated by the blurring effect of the rapid sequencing of fields. Consequently, fainter stars are visible on streaming video than on still video fields. Even on streaming video, the noise causes the appearance of stars near the limiting magnitude to appear unstable, with intermittent visibility. Some observers have found that a high gain setting on a videocamera detracts from the visibility of stars by means of a great increase in noise. This is not the case with the Watec 902K. The high gain setting increases noise but increases the visibility of faint stars far more. If a videocamera generates more image noise, there will be greater differences among the three types of limiting magnitudes. These differences are not greater with the Watec 902K than with the PC-23C, suggesting that the noise is not higher with the new generation camera than it is with the older one.

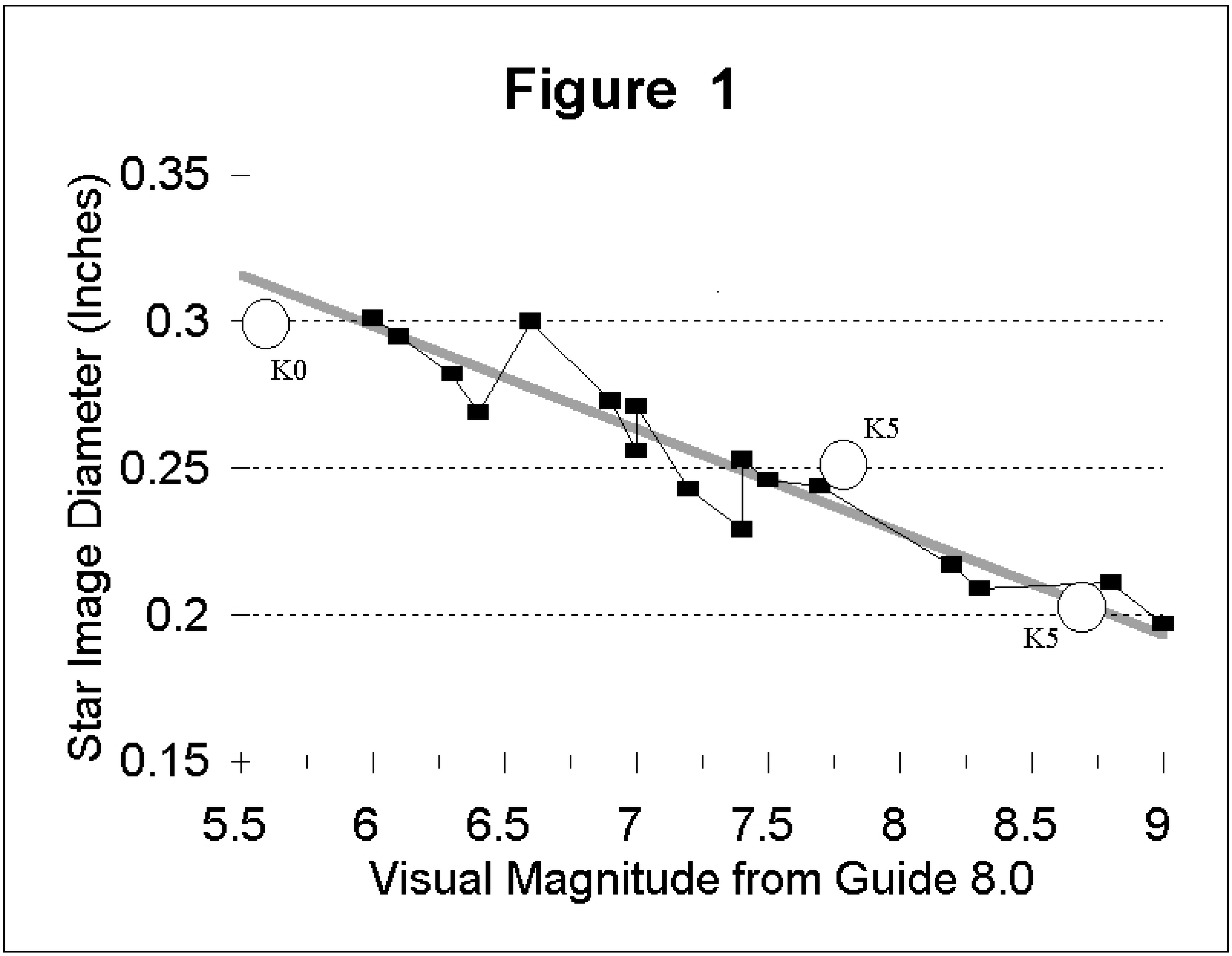
The effect of focal length.

The improvement in limiting magnitude by the use of short focal length is significant with this 280-mm aperture telescope. It seems likely that there is a focal length sufficiently short that further shortening results in no further gain in sensitivity. Further study is needed to ascertain what focal length this might be. However, if the seeing disk of the star is 2 arcseconds and the resolution of the video is two pixels of the CCD chip, an f ratio of 3.6 with this 280-mm aperture places the entire seeing disk on a single video resolution unit. Thus, the system may already be sufficiently short to optimize sensitivity.

Readers may wish to apply the present results to their own video systems to predict the limiting magnitude that can be expected. However, this extrapolation cannot be done by using only the data presented here, because the limiting magnitude is dependent on focal length as well as on aperture. If a reader has determined his limiting magnitude with a PC-23C videocamera, he can expect to detect stars about 1.5 magnitude fainter when using the Watec 902K.

Lux ratings.

The sensitivity ratings published by the manufacturers of these two cameras do not convey their true sensitivities. The lux ratings suggest that the Watec 902K is 160 times more sensitive than the PC-23C, while the limiting magnitude difference of 1.5 magnitudes proves it to be 4.0 times as sensitive. Perhaps better standardization of sensitivity ratings is needed, but ultimately the best approach for astronomers will be to perform limiting magnitude tests, such as the present one, on future generations of videocameras.



Star image size.

Figure 1 shows that the relation between star image size and magnitude is linear with the Watec 902K camera. Before the advent of photoelectric photometers (and long before the advent of CCD photometry), stellar magnitudes on photographic plates were known to be proportional to image diameters (and image densities) (7). It is likely that this linear relationship holds true for other videocameras as well. Because stars cease to be visible on the video screen before their image diameters reach zero, there is a difference between the limiting magnitude of 14.6 calculated by regression analysis and the limiting magnitude of 13.2 that was observed. Thus, this study demonstrates that it is not valid to compute video limiting magnitude by measuring star image sizes and then using regression analysis.

Knowledge of the relationship between star image size and star magnitude will be useful for estimating the brightness of meteor flashes on the moon.

Star image size and spectral class.

The video brightnesses of both the A0 and the K stars in M7 are strikingly similar to their visual brightnesses. Note that the M7 stars of Figure 1 were at a lower altitude than were the M11 stars used to ascertain the limiting magnitude in Table 1. The lower altitude must have caused the camera to appear less sensitive than it would have with a cluster higher in the sky, even though the calculated limiting magnitude was 14.6. Extinction seldom has a significant relationship to spectral class, and such second-order extinction can generally be ignored (7). Further, if second-order extinction were important then one would expect the low altitude to augment the visibility of red stars, not diminish it. Consequently, it is unlikely that the failure to demonstrate a greater sensitivity to K stars is due to the cluster's altitude. Rather, it is likely that the greater sensitivity of videocameras to red stars is less significant than it is reputed to be. It is possible that stars of spectral class M, which were not included in the present study and which are characterized by broad absorption lines in the blue end of the visible spectrum and proportionally higher output of infrared light, would appear brighter with a videocamera. Further study is needed to confirm this.

Television settings.

It is noteworthy that the television settings have a pronounced effect on the visibility of stars. The negative effect of "sharpness" may seem counterintuitive to some persons.

References

1. Horne J (2003), "Four low-cost astronomical video cameras." *Sky & Telescope 105*(2):57-62.

2. Dunham D (2003), "Planetary Occultations for 2003." *Sky & Telescope 105*(3):101-106.

3. Watec America Corporation (2001), "Technical order: LCL-902K," product information sheet published by the manufacturer. Las Vegas, Nevada, USA.

4. Burnham R (1978), *Burnham's Celestial Handbook, Vol. 3*. Dover Publications, Inc., New York.

5. Gray W (2002), *Guide 8.0.* Project Pluto, Bowdoinham, Maine, USA.

6. Borland International (now Corel) (1992), *Quattro Pro for Windows*. Ottawa, Canada.

7. Henden A, Kaitchuck R (1990), *Astronomical Photometry*. Willmann-Bell, Richmond, Virginia, USA.

On Directions in deploying Grazing Occultation Predictions

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In addition to the article 'Two GPS Applications for Support of Graze Expeditions' by W. Rothe (O.N. Vol. 9, No. 3, July 2002, page 4-7) some more explanations should be given. The article describes how to find a place in the needed distance to the predicted limit. However, it may be somewhat misleading as it doesn't mention expressly that there are two corrections which need to be applied into two different directions.

The profile correction is done to place a single observer within a selected profile region, e.g. for seeing (hopefully) the most contacts or to cover the profile best with observers in an expedition. It's particular value in kilometers or miles can be taken from the scale at the right hand side of the GRAZEREG profile plots. This correction according to the predicted profile geometry is always measured perpendicularly to the limit. It can be realized by two methods: The one way is to draw the predicted limit on a map and then to plot a parallel line with the appropriate distance according to the particular profile. The other way is more mathematical and uses the quantity HEADING. This quantity is printed at the bottom of the GRAZEREG profile prediction and gives the azimuth direction of the lunar motion on the earth's surface.

The altitude correction considers the shift of a point in the predicted limit if the observer's site is situated higher than at sea level. This altitude correction isn't measured perpendicularly to the limit but into the direction of the star, which is mathematically described by the azimuth of the star. It's value is calculated from h * TANZ. It has the same unit [m or km] as the site's height or altitude h. TANZ is given in the predictions or can be calculated from tan z (tangens zenith distance) or cot AL (cotangens star's altitude).

Normally, the HEADING and the azimuth of the star don't coincide. Thus, the two corrections need to be applied separately. Of course, it should be possible to join the both within one single formula by transforming the one correction to the direction of the other correction. However, it seems more advisable to apply the two corrections separately. This is helpful to better understand their different origins and to distinguish their different magnitudes.

Even in using modern equipment like GPS receivers it is always desirable to have a basic knowledge on the astronomical background of the matter for which the equipment is employed actually. ■

The Discovery of the Binary Star SAO 77638

Hal Povenmire

Usually a grazing occultation is attempted only if the conditions are exceptionally favorable. The grazing occultation of SAO 77638 was attempted only because it was close by and there were a number of observers who would attend because the conditions were favorable and the hour was convenient. This star is also know as X7734 and B.D. +28 918. This graze occurred in the early evening of April 10, 1989. The Moon was a waxing crescent, 30% sunlit and high in the western sky. This white, AO spectral class star was only magnitude +8.0.

The sky was very clear that night and the seeing was very steady. The Moon was near the Milky Way and was in a star rich portion of the sky. An added attraction was that there were a number of other occultations that could be observed at the same location.

On that night I called a number of observers out for this observation. When the star moved up to the dark northern limb, it suddenly dimmed for a full second and then resumed normal brightness. There were usually only two reasons why this could occur. One, the star was a previously undiscovered binary or two, the atmosphere was turbulent. The atmosphere seemed steady so I paid close attention to the next events. The next event was the Disappearance and it seemed sharp or fairly normal.

When the star Reappeared, it came out dim, only about half brilliance. Then 1.8 seconds later it brightened to full brightness. This is nearly an absolute confirmation that the star was a binary.

This discovery was reported to the Smithsonian Astrophysical Observatory, IOTA, and The International Lunar Occultation Center in Japan.

The Center of High Angular Resolution in Astronomy (CHARA) is located in Atlanta, Georgia. It is a research group that is part of Georgia State University. They use a technique called Speckel Interferometry to resolve close binary stars. On February 16, 1997 they observed this star. They were able to split this new binary and the magnitudes of the components were approximately +8.5 and +8.6. This confirmation is an excellent example of where advanced amateur astronomers make a discovery and then a professional group makes a confirmation. This is Science and Astronomy at its best. ■

The Serendipitous Discovery of the Binary Star Z.C.601

Hal Povenmire

Numerous binary stars have been found during grazing occultations by the Moon. This is possible when the Moon covers the brighter component but leaves the previously unknown companion visible. More unusual is when during a routine occultation observation a star noted to disappear is a stair step fashion. This usually happens too fast to be detected by the human eye.

On the evening of February 28, 1993, there was a favorable grazing occultation of 37 Tauri just north of Savannah, Georgia. My wife and I drove to the area and set up at a deserted church that was a landmark of the topographic map. It was only when we set up our telescopes that we noted that a +5.96 magnitude star, ZC 601 was going to be occulted only about 3 minutes before the graze star. This star is also known as SAO 74638, BD +21 587 and 39 A2 Tau. Normally, these occultations are very sharp because there is no atmosphere on the Moon. When this star disappeared, it went out in two very rapid distinct steps. This is the obvious indication that the star was a previously undiscovered binary.

This observation was properly recorded and reported to IOTA and the International Lunar Occultation Center in Japan. Later, it was reported to the Center for High Angular Resolution in Astronomy (CHARA). This is a part of the Astronomy Department at Georgia State University in Atlanta, Georgia. They use a technique called Speckel Interferometry to resolve close binary stars. They observed this star and resolved it into its two components.

If it had not been for the favorable graze of ZC 599, we would not likely observed the occultation of ZC 601. This was a perfect example of a serendipitous discovery. The great scientist, Louis Pasteur stated, “In the field of observation, Chance favors the prepared Mind!” ■

Discovery Of A New, Bright Binary Star – 65 Alpha Cancri

Hal Povenmire

Reduction of the grazing occultations of Alpha Cancri or Acubens on 5/27/93, 9/13/93 and 10/18/95, show that this wide binary system is actually a triple system. Acubens is magnitude +4.3 and is of A3 spectral class. A magnitude +11.8 field star may or may not be a companion. The faint star is located 11.30 arc seconds distant at a position angle of 325°.

Reduction of the three grazing occultations clearly show that the primary is itself a previously undiscovered close binary with a separation of approximately .1 arc second. The components seem to be of approximately equal magnitude. Acubens is also known as Zodiacal Catalog or Z.C. 1341, SAO 98267, HD 76756 and BD +12 1948. This star was observed under a good selection of position angles by many observers and also the companion was captured on video tape. It was remarkable that all three graze paths were favorably placed over the east central United States

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IOTA/ES information September 2003

Dr. Eberhard H. R. Bredner, secretary IOTA/ES

A: Beginning this year October IOTA-ES will create a regular service by e-mail as an European supplement for interested members. This service runs 4 times a year (January, April, July, October) by e-mail only to reduce costs of postage. If necessary we will also circulate a last minute service.

You will get an e-mail: general information about current observation projects, information about the association IOTA-ES and so on.

All members will get a copy with the following O.N.

If you (IOTA-ES members only) have any information to the community of "e-mail members" you should send your contribution not later than the last day of the previous month. You will get a confirmation that I received your mail. The "circular-email" will arrive not later than the 10th of the month. If you want this service and you get no e-mail from thulicon@t-online.de <my private address> I have no current e-mail address from you, then you should inform me.

B: Annual meeting// workshop CCD-cameras

Due to time problems and the upcoming wintertime (mostly bad weather conditions) we postponed both arrangements. As a final date the weekend April 3/4 in 2004 was fixed. More information will follow.

C: ESOP XXII Trebur was a great opportunity to talk to old friends, hear new ideas and have some interesting excursions. Thank you "local committee".

We only missed our friends from Italy and the Netherlands totally. Next ESOP will be in Paris August 27/29 in 2004. Please keep this opportunity in mind.

IOTA's Mission

The International Occultation Timing Association, Inc. was established to encourage and facilitate the observation of occultations and eclipses. It provides predictions for grazing occultations of stars by the Moon and predictions for occultations of stars by asteroids and planets, information on observing equipment and techniques, and reports to the members of observations made.

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IOTA European Section (IOTA/ES)

Observers from Europe and the British Isles should join IOTA/ES, sending a Eurocheck for EURO 20,00 to the account IOTA/ES; Bartoldknaust Strasse 8; D-30459 Hannover, Germany; Postgiro Hannover 555 829-303; bank code number (Bankleitzahl) 250 100 30. German members should give IOTA/ES an "authorization for collection" or "Einzugs-Ermaechtigung" to their bank account. Please contact the Secretary for a blank form. Full membership in IOTA/ES includes one supplement for European observers (total and grazing occultations) and minor planet occultation data, including last-minute predictions; when available. The addresses for IOTA/ES are:

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IOTA on the World Wide Web

(IOTA maintains the following web sites for your information and rapid notification of events.)

IOTA Member Site
http://www.occultations.org

This site contains information about the organization known as IOTA and provides information about joining IOTA and IOTA/ES, topics related to the *Occultation Newsletter*, and information about the membership--including the membership directory.

IOTA Lunar Occultations, Eclipses, and Asteroidal and Planetary Occultations Site
http://www.lunar-occultations.com

This site contains information on lunar occultations, eclipses, and asteroidal and planetary occultations and the latest information on upcoming events. It also includes information explaining what occultations are and how to report them.

IOTA's Telephone Network

The Occultation Information Line at 301-474-4945 is maintained by David and Joan Dunham. Messages may also be left at that number. When updates become available for asteroidal occultations in the central USA, the information can also be obtained from 708-259-2376 (Chicago, IL).