LEICA 25X-50X VARIO ASPH ZOOM PLANETARY TEST

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The Leica Vario 25x-50x ASPH Zoom is an 8 element eyepiece with an effective focal ratio range of 8.9mm to 17.8 mm when used with a telescope. The eyepiece is designed for Leica spotting scopes, and was introduced in 2009 along with the Leica APO-TELEVID 82 spotting scope. This eyepiece is Nitrogen-purged, waterproof, and has an apparent field of view (AFOV) that is marketed as being 60 degrees or more over its entire zoom range. For astronomical applications a third party adaptor is required for use with 1.25" or 2" focusers. The intent of this test is to evaluate the Leica Vario ASPH primarily in the role of an unconventional planetary eyepiece. As such, a high quality Baader VIP 2x Barlow was used in combination with the Leica Vario ASPH to obtain short enough focal lengths with the telescopes used for effective planetary magnifications.

INDOOR TESTS & MEASURES

In bench test measures, this eyepiece was measured to have an AFOV which varied from 58 degrees at the 17.9mm setting, to 75 degrees at the 8.9mm setting. The bench measures of the AFOV were then double checked visually in comparison to a Sterling Plossl eyepiece which has a measured AFOV of approximately the same size and they were found to be coincident. At the 8.9mm setting the measured 75 deg AFOV was checked visually and found to be mid-way between the AFOVs of a TeleVue Panoptic (68 degrees) and a TeleVue Nagler (82 degrees). So visual assessments against baseline eyepieces aligned with bench measures.

The eye lens of the Leica measured in at 26mm in diameter, and the eye relief (from center of eye lens) bench measured in at approximately 13mm when set at 8.9mm, and 16mm when set at 17.8mm. It should be noted that other amateur astronomers have reported different eye relief measures, some reporting a constant 18mm eye relief throughout its zoom range, to others reporting the eye relief varying between 14mm to 18mm, or 17mm to 18mm, or 17mm to 19mm through the zoom range. Given the discrepancy in reported measures, if your eye relief need is critical, it would be best advised to try to find another amateur astronomer from whom you can borrow or use this eyepiece to confirm it will meet any stringent eye relief needs you may have. Otherwise, Cloudy Nights member Andreas Braun (Cloudy Nights ID: andydj5xp) has made multiple measurements more recent than mine on a Leica Vario ASPH, and has used multiple techniques. His figures may therefore me more representative, which are an eye relief that varied from 17mm to 19mm over the zooming range. It should also be noted that the eye lens is inset from the top housing's rubber eye guard by approximately 4mm, so "usable" eye relief figures will be less than the optical measures by this amount.

Using indoor test targets, off-axis rectilinear distortion (RD) appeared to be very minimal if not near zero at the 17.8mm setting, and only very slight at the 8.9mm setting. Angular Magnification Distortion (AMD) was similarly minimal being fairly imperceptible at the 17.9mm setting and only very slight at the 8.9mm setting. Slight lateral color was evident far off-axis approaching the field stop. No focus shift was noted during zooming. Overall, the Leica demonstrated one of the better orthoscopic fields of view I've seen in modern eyepieces.

AFOV	58º - 75º
Eye Relief *	17mm – 19mm (eye lens sits 4mm below rim of housing)
Rectilinear Distortion	Minimal
Angular Magnification Distortion	Minimal
Lateral Color	Moderate (far off-axis; minimal with Barlow)
Field of View Orthoscopic Characteristics	Excellent
Field Stop Offset	-20mm (negative indicates above the focuser shoulder)
Eye Lens Diameter	26mm

* As reported on Cloudy Nights by Andreas Braun. Read this section for details on user measurement discrepancies.

Due to the need for an adapter for use in 1.25" and 2" focusers, the APM adapter used during this test added some significant distance between where the shoulder of the adapter contacts the focuser, to the field stop of the eyepiece. With the 1.25" adapter in place, the field stop was located a full 20mm above the shoulder of the eyepiece. This extra long 20mm distance meant that Barlows were not likely to be operating at their advertised magnification since this 20mm distance acted like an extension to the Barlow. The TeleVue 2x Barlow, when used with the Leica Vario ASPH actually produced 2.42x when used with this 1.25" adapter. The Baader VIP 2x Barlow varied slightly depending on the zoom setting, between 2.34x when the Leica was set at the 17.8mm to 2.37x at the 8.9mm zoom setting. With the 1.25" adapter the Leica's 8.9mm-17.8mm Zoom range therefore became 3.8mm-7.6mm when used with the Baader 2x VIP Barlow, and 3.7mm-7.4mm when used with the TeleVue 2x Barlow.

OBSERVATIONAL TESTS

Observations for the nighttime tests were performed through two scopes: a 10-inch (254mm) Orion XT10 f/4.7 Dobsonian, and a 4-inch (102mm) Takahashi TSA-102 f/8 APO. Since the purpose of this test was to evaluate primarily the planetary performance of the Leica Vario ASPH compared to classical planetaries, the chosen targets were Juipter, Mars, and the Moon, all well positioned during the observations.

Eyepieces used to compare against the Leica Vario ASPH were the 8mm and 10mm AP-SPLs, 8mm Brandon, 6mm ZAO-II, and 5mm Pentax XO. A 20mm XW and Explore Scientific 6.7mm ES82 were also utilized briefly to compare wide field attributes and some planetary. The Barlow used with the Leica Vario ASPH was the Baader 2x VIP Barlow. Barlows used for the planetary eyepieces and the XW, were the Baader 2x VIP, TeleVue 2x, Siebert 2.5x, and a Siebert 4x-5.5x Zoom Barlow in combinations as appropriate to reach the needed equivalent focal lengths. Note that the Siebert 4x-5.5x Zoom Barlow actually has a measured starting magnification of 3.7x and not 4x, so this was taken into account to ensure all effective focal lengths were equalized for the comparisons.

The observations for this test was conducted over several weeks during multiple evenings from February through March of 2012. The observing site was a light-to-moderately light polluted suburban Virginia location west of Washington, D.C. Seeing conditions for each recorded observation ranged between Pickering 7 to 9. All results were confirmed through repeated evaluations on multiple evenings using multiple scopes.

JUPITER OBSERVATIONS

Using the TSA-102, testing began with the Leica mated to the Baader VIP Barlow (set at effective 5mm, 6mm, and 7.6mm) against the 8mm AP-SPL, 8mm Brandon, 6mm ZAO-II, and 5mm Pentax XO. The observed details on Jupiter between the Leica and ZAO appeared

relatively equal, excepting that contrast appeared a little better with the ZAO and XO, showing Jupiter's bands in richer, darker hues. Scatter between the two also seemed on-par. However, the scatter in Leica appeared slightly brighter and closer to the planet than in ZAO. Scatter in ZAO showed less brightly, but over a larger area.

Moving to the greater aperture of the XT10 Dob, the Leica with Baader VIP Barlow easily showed more details and better contrast on Jupiter than did the 8mm Brandon. Quite a feat given all the elements in the Leica. When I compared the Leica to the AP-SPL it was more of a battle and they were very close. It came down to how detailed the edges of Jupiter's SEB and NEB appeared between the two, how much gradations there were in the North and South polar regions, and how discernable the STB was presenting. It was a close fight but I feel a very slight edge went to the Leica. Again, contrary to my expectations and experience, no other complex design eyepiece I have used comes close to this type of planetary performance where it can rival and sometimes beat the performance of a classic minimum glass premium planetary. How Leica achieves this I can't say, but I guess its price is certainly reflective of this. In the end, even though there were times where I felt the Leica with VIP was out performing the AP-SPL, they were close enough that they should really consider them on-par.

When I moved to what I consider a step up from the AP-SPLs, to the 6mm ZAO-II and 5mm Pentax XO, both of these bested the Leica with Baader combination. Basically the scatter was less in these eyepieces vs. the Leica with Baader Barlow. Jupiter's STP was much more pronounced as were the shading gradations of the polar regions, all showing more impressively in the ZAO. Contrary to what showed in the TSA-102, scatter appeared subtly more in the Leica vs. the ZAO using the XT10 Dob. Some details of the NNEB and SSEB visible in the ZAO, were however lost in Leica-Baader combination. Of prominence in this loss was a very small barge that was observed in the ZAO, which the Leica just would not reveal regardless of the number of tries during the evening.

Next I decided to see how another Barlowed wide-field would perform against the Leica with Baader Barlow combination. For this test I chose a 20mm XW mated with a Siebert Zoom Barlow set to 3.7x. In this comparison the Leica with Baader Barlow combination soundly beat the Pentax XW with Siebert Barlow combination. Striations in Jupiter's polar regions were clearly visible in the Leica and completely absent in the XW. Concentrated regions of dark shading in polar regions were diffuse and non-descript in XW, but was nicely formed and discretely layered in the Leica. Detailed structures in SEB were profuse in Leica, while being only sparse in comparison in XW. This was certainly a surprise as I consider the XW's to have some of the best on-axis optical performance of any wide-field in the market. If I had a 10mm XW available so I could have utilized a less extreme Barlow, then perhaps the outcomes would have been different. At any rate, even against other highly regarded complex designs the Leica appeared to be more than capable and a better show.

MARS OBSERVATIONS

Turning to Mars, comparisons between the Leica with Badder Barlow combination showed to be similar to observations recorded with Jupiter, however there was not as great of a difference. Using the TSA-102, Mars appeared slightly brighter through the ZAO and XO than it was in the Leica with Baader Barlow. With the XO in particular, Martian features appeared slightly more prominent and with greater contrast showing between darkest and brightest features. Sinus

Sabaeus showed a greater extent using the ZAO or XO, and there were hints of Solis Lacus observable which were not present using the Leica with Baader Barlow.

Observing Mars with the XT10 Dob, scatter was estimated to be between two and three Martian diameters using the ZAO. Using the Leica with Baader Barlow, scatter appeared more and extended to between three and four Martian diameters. Transmission and contrast appeared slightly less in Leica with Baader Barlow also as Maria showed dimmer and less dark. Other than these small differences the performance was fairly on-par with the classic premium planetaries with Mare Acidalium, Mare Erythraeum, Margaritifer Sinus, Sinus Meridiani, Sinus Sabaeus, *Niliacus Lacus*, and the polar cap all clearly visible. So while Jupiter offered up more clear advantages using the classic premium planetary eyepieces, with Mars the differences were much less pronounced and subtle in nature. Perhaps the only exception to this generalization would be with the Pentax XO, which noticeably showed Maria as being richer and darker and extending more into planet, particularly Sinus Sabaeus. The Martian polar cap and Solis Lacus were also clearly more evident using the XO compared to the Leica with Baader Barlow combination.

For a wide-field to wide-field experiment, I briefly compared the Leica with Badder Barlow combination against an Explore Scientific 4.7mm ES82. The Leica with Badder Barlow easily outclassed the 4.7mm ES82. The Leica with Baader Barlow showed significantly less scatter and consequently more of the details on the planet.

LUNAR OBSERVATIONS

For Lunar observations, differences between the Leica with Baader Barlow combination and the classic premium planetaries were much less pronounced. Basically only the subtle ejecta patterns around craters and through the Maria showed slightly more distinctly in the classic planetary eyepieces. Other high contrast details on the Moon appeared on-par whether viewed with the Lecia with Baader Barlow, or the ZAO, or the XO. What was of significance though was the expansive field of view provided by the Leica compare to the classic planetary eyepieces. Lunar observing was visually much more impressive through the 60 to 75 degree AFOV of the Leica compared to the 45 degree or less AFOV of the other eyepieces. In addition, the ability to instantly zoom in closer or further away made the Lunar observing session with the Leica much more interactive and engaging.

MISC NOTES

Handling of Fast Focal Ratios -- Removing the Baader Barlow from the Leica and adding the TeleVue Paracorr to optical train in the XT10, I performed tests to evaluate lateral color and off-axis performance. Lateral color I judged to be at what I consider moderate levels in the Leica starting at about 75% to the field stop. I could tune the Paracorr so that 75% of the FOV of the Leica was what I considered well corrected with planetary detail remaining substantially in tact. However, exit pupil placement proved to be somewhat sensitive and would induce lateral color if not exactly centered. Without Barlow in a fast Dob, given that even with a Paracorr about 25% of the field of view showed moderate lateral color, I would not characterize the Leica's off-axis performance near as good as other wide-fields like the TeleVue Naglers. With Barlow however, the Leica was an outstanding performer in fast Dobs, particularly for planetary allowing some

significant and welcomed drift time compared to the small AFOVs of classic planetary eyepieces. With no Paracorr but with Barlow, in a fast Dob the Leica showed a crisp and detailed planetary image over 75% of its field of view, like it did with Paracorr in place but with no Barlow. The off-axis did show some minor field curvature however, with some minor lateral color as well, but not enough to be what I consider bothersome with planetary observations.

Eye Lens Reflections – The top of the eye lens of the Leica did show reflections from external light sources around my observing site. In comparison, the Pentax XW showed no reflections off the eye lens while observing. I did not find these to be bothersome so they were fairly well controlled and much less than what I have observed from the non-ASPH Leica zooms.

Barlow Differences -- During the course of observations I did conduct some brief comparisons between the Baader VIP Barlow and the TeleVue Barlow to see if either of these 2x Barlows showed any advantage. The Baader 2x VIP Barlow showed a slightly cooler toned image than did the TeleVue. This difference was readily apparent when the two barlows were switched. I would also say that the Baader 2x VIP showed a slightly crisper planetary image as well. However, on Jupiter the warmer tonal quality of the TeleVue did make the atmospheric banding show slightly better. So any loss of crispness from the TeleVue is countered in my opinion by how the warmer tone made features appear more distinct on Jupiter. Turning from Jupiter to the Moon however, this advantage from the warmer tone was a disadvantage as Lunar ejecta patterns showed much better with the cool to neutral tone of the Baader VIP, bringing out the maximum of details in these structures. So tonal differences can be of subtle advantage, but vary from advantage to disadvantage based on the target observed.

CONCLUSIONS

In my estimation, the Leica Vario ASPH with the Baader 2x VIP Barlow provides a view almost as good as some of the more exotic classic planetary eyepieces. This testing demonstrated that it was a real battle-royal between the Leica Vario ASPH and what I characterize as a Tier-2 premium classic planetary, the AP-SPLs. Some evenings the Leica Vario ASPH very slightly bested this top performing planetary, and on other evenings only very slightly underperforming the AP-SPL. However, when compared to the most highly renowned classic planetary eyepieces, the ZAOs and XOs, while the Leica Vario ASPH could come close it could not beat these best-in-class eyepieces.

While it runs contrary to the conventional wisdom of trying to minimize the glass for the most critical planetary observations, this Leica Vario ASPH zoom challenges that wisdom and demonstrates that even though it is a complex multi-element design, it can still effectively compete with the “big boys” of classic planetary eyepieces, providing a level of comfort and flexibility that the classic minimum glass planetary eyepiece just cannot replicate. The Leica Vario ASPH zoom, when used with a high quality Barlow like the Baader 2x VIP, makes a potent planetary combination showing details as good as some of the better classic planetary eyepieces and doing it with much improved eye relief, expansive AFOVs, and with a much welcomed wide field of view that was also very substantially orthoscopic. My take-away from the many observing session I had with the Leica Vario ASPH for planetary observing was that while it was not on-par with the very best planetary eyepieces that have been produced, it was certainly close enough to make me feel that any losses were not all that consequential for 99% of my observing needs for planetary. And where this eyepiece trumped the classic planetaries was

in its extreme comfort of use and view, and comparatively very large AFOV, all the while maintaining an exceedingly sharp and high contrast planetary view. As the evenings wore on during my testing, I noted that when I finished my tests and turned to planetary observing for my own benefit, I always used just the Leica Vario ASPH for the remainder of the evening as it was a pure joy to use and the planetary imagery it provided was so detailed and precise. It was also nice to not have to remove it from the focuser as even with Barlow its longest focal length of near 8mm and 100x in the TSA-102 provided a sufficiently large true field of view for pleasurable context around targets. Then with its ability to zoom to slightly under 4mm and more than 200x in the TSA-102 really made it a nice one-eyepiece-show for a productive evening of Lunar and planetary observing. Similarly, in the XT10 it provided a very effective 150x to 300x magnification range. In the end, I felt its many strengths far outweighed any slight loss in its image where it could not keep pace fully with something as exotic and extreme as a ZAO. The Leica Vario ASPH provided this planetary observer with a very satisfying experience and it certainly demonstrated a capability for planetary far superior to other wide-fields I have tried in this role while it came close enough to the on-axis performance of best-in-class classic planetary eyepieces to make it a real planetary treat.

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