

Two Tiny Apos from William Optics

The 66 SD Doublet and 66 ED Triplet
Tom Trusock – 2/06



Left - Triplet, Right - Doublet

William Optics 66 SD Doublet - \$398	
Likes	Dislikes
Good color correction Lightweight Dual Speed Focuser Included Hardcase	Color correction not quite the same level as the Triplet

William Optics 66 ED Triplet - \$498/\$548	
Likes	Dislikes
Excellent color correction Lightweight Included Hardcase	Field not as flat as I'd hoped Dual speed focuser is \$50 extra (if purchased with scope)

Small telescopes - seems like I've seen a ton of them this past year. From the WO 66 petzval, to the Tak FS60c, the TV60 and a ton of different 80mm telescopes from various vendors – and I'm getting the feeling that I've seen a pretty good sample of the different offerings out there.

Right up front I'd point out that these tiny telescopes aren't for everyone. When we're talking about the apos - for their size, they can be very expensive. Even the least pricey often costs as much as an inexpensive 6 or 8 inch dob which should show you far more- at least that's the traditional thinking, right?

And let's be honest – a 60 or 66mm telescope is a small scope. Very small. In fact, their size has had some of the forum members asking “What good's a 66mm telescope anyway?” There are a lot of comments to the effect of: “I always think 80mm is the bare minimum.”

I guess it all depends on your perspective. You could always extend that to ask; “What good's a 3.1 inch telescope scope anyway?” I mean I'm not going to be pulling out the Hicksons with it, right? For that matter – what good's an 8” or a 12” if those are your intended targets? I tend to think of telescopes like fishing gear. You've got your lightweight tackle for small lakes and streams, and deep sea setups for those who prefer to go deep. While I'll grant that I wouldn't want one of these for an only or first telescope I can have as much fun with a small telescope as I can with a big one. Personally, I think there's a place for all apertures.

As a matter of fact, as I write this, I just got in from an impromptu session with one of the two new scopes WO shipped me directly - their 66mm SD doublet. I'd not been feeling well all day, and although I watch the weather on a habitual basis, I'd seen nothing that would even think I'd spend any time at all outside. Both Weather Underground and the Clear Sky Clock had predicted cloudy skies for the entire day, and it looked like that was

going to be the case. So I spent the evening with the family and put in a little time on CN. As I sat down to watch a little TV, I noticed the moon peeking in and out of clouds through one of the windows, but didn't give it much thought. An hour or so later I took the garbage out, and was startled to look up into a crystal clear sky.

This was where the ultra light, ultra portable scope came in handy. My FS102 and 18" Obsession were both in the garage, but both mounts require power and are - well - not exactly lightweight tiny things (particularly when you consider the mounts). The 66mm SD doublet OTOH - that I can simply leave setup on a lightweight camera tripod, grab two eyepieces and be out observing in a matter of minutes.



The Triplet (front), is about 2 inches longer than the Doublet (rear)

So I did just that.

In quick succession, I hit M31, the double cluster, M103, several of the NGC's in Cass, M45, M1 and more. It was a 20 minute quick fix that I wouldn't have had otherwise.

And people still ask what good tiny scopes are.

In any case, this article is really about two different scopes: The William Optics 66mm ED triplet, and their newer SD doublet.

First looks

The standard 66mm ED triplet comes with a single speed focuser, and the doublet with a dual speed – (more on that later). Both came with the standard black anodized ZenithStar finish, L bracket for mounting, rotateable Crayford 1.6" focuser, retractable lens shade, press on lens cap and 1.25" visual back. The doublet's drawtube was calibrated, and it comes standard with the dual speed focuser. The visual back on the 66mm WO scopes is a little different in that it's threaded for SCT accessories. If you want to use a 2" diagonal with the scope, all you need to do is unscrew the 1.25" visual back, and screw on a 2" SCT adapter - be warned though, many users experience focus travel issues when using non-Williams SCT diagonals so if you are going to go this route, I'd recommend that you check on which diagonals will come to focus and which ones won't. I own one of their Quartz Pyrex SCT Dielectrics (an excellent diagonal), and that was what I used on the refractors for the test period.

Both use the now standard cone baffle system. While both list 10 baffles, that's not completely accurate – there are 10 ridges on the cone, and the edge of the cone itself serves as a true baffle. In any case both scopes are acceptably well baffled.



66SD Doublet

Mechanics (on both scopes) are top notch. The new two speed focuser is a joy to use (particularly on their faster telescopes) and as previously noted is standard on the doublet, and is available as a retrofit for the triplet at around \$150 or at initial purchase for an additional \$50. Like many on the market, it replaces a focus knob. If you install it yourself, you can install it on either side of the OTA, but if it comes fitted it seems to come on the right side as standard. It provides an inner knob with standard or coarse focus, and an outer knob that provides 10-1 reduction. Tension needed to move the outer knob is extremely light - simply a fingertip's pressure is needed.

Some users have complained about a sinusoidal feeling in the coarse focus. After looking at several of these focusers, I've typically found this is caused when the fine focus is not adjusted correctly. Timm Bottoni goes into this in a bit more detail in his article about the ["William Optics 2-Speed Microfocuser"](#).

The doublet is a TMB design that is 2 inches shorter than the triplet, and slightly lighter. William Optics lists the focal length of the doublet at 388mm and 460mm for the triplet. Please note that I did not verify this experimentally.



Left - Doublet, Right - Triplet

The coatings on the doublet were unquestionably better than those on the triplet. I've seen a few WO scopes at this point, and frankly, these coatings looked better than anything else I've seen. Close inspection revealed a lens cell touting STM coatings - since I'd not heard of these, I contacted WO directly and was told this was a new type of coating designed to provide better transmission than other coatings used in the past. STM stands for Super Transmission Coatings - whatever they call it, it certainly works. The lens virtually disappears on the 66 doublet - note the photo above. I'd be very surprised if WO does not make these their standard coatings from here on out. Indeed, it looks like the new ZenithStar 80 Fluorite Doublet (anniversary edition) has also shipped with these coatings, and hopefully this is their new standard.

The coatings on the triplet, on the other hand, are the more common deep purple coatings one has come to expect.

While the doublet came in black and gold, Mr. Yang shipped me two different versions of the triplet - the first with standard black anodizing, while the second came tricked out in a deep red with black and gold trim. With its gold lens cap, this has to be one of the prettiest telescopes I think I've seen. While the the red version of the 66 triplet is not yet on the shelves, I've been told it should be shipping shortly.



The red triplet w/ dew shield retracted

The red triplet came standard with the dual speed focuser, while the black triplet arrived with a single speed crayford. The the triplet is offered with the dual speed focuser for an extra \$50. Users who have previously purchased the triplet can also purchase an upgrade to the dual speed focuser for \$148.

Optical Evaluations (Visual)

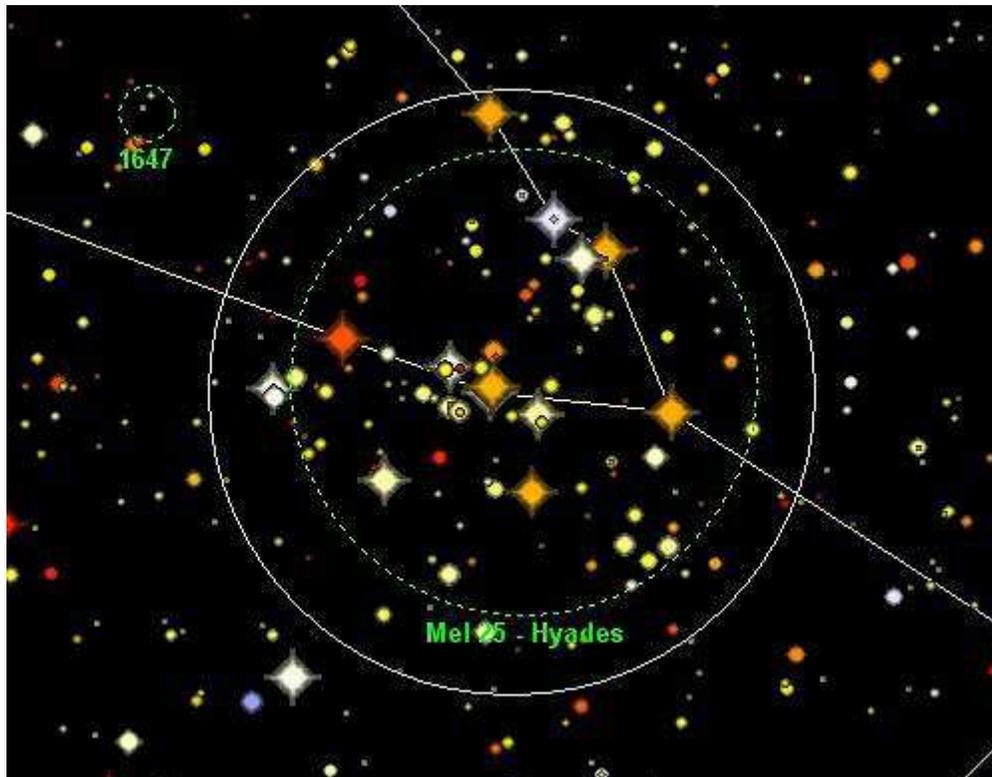
The triplet is noticeably longer and heavier than the doublet and takes a bit more time to cool down. It's winter here in the eastern mid-west (we have four seasons: pre-winter, nearly winter, winter and post winter) so I've had several opportunities to see how well (or poorly) these scopes handle significant temperature changes. While it's not uncommon to see signs of pinched optics or spherical aberration in a refractor during cool

down, even in far more expensive telescopes, these have surprised me. I've yet to see any serious issue with either. To me, that marks a well designed lens cell, and is an important consideration for northern users.

The field visually appeared slightly flatter on the triplet (however, interestingly enough, preliminary photographic results don't appear to be bearing out a very flat field for the triplet – more on that later), and the color correction is definitely a step better. While in focus false color is virtually non-existent, the doublet revealed what I would consider to be typical of a good ED/SD doublet. Out of focus color on bright targets was green/yellow on one side of focus, and purple on the other. The triplet - well, there was pretty much no false color. Zip, Zero, Zilch - or to use one of my young daughter's favorite words – Nada. No signs of color either in focus or out.

While both views were exceptionally good for refractors of this size, I actually liked the doublet just a touch better – although it has slightly greater chromatic aberration, it also seems to have a bit more contrast. I don't know if it was the improved coatings or one less optical element, but I suspect they both had a little to do with it.

While DSO views were quite good (the colors of individual stars in open clusters just seemed to "pop" with both scopes), it was the moon that I found most rewarding. There's SO much that a small refractor can show you on Luna, it's not funny - even one as small as 2.4 inches.



*Max TFOV on these scopes is around 7 degrees
Image Credit SkyMap Pro*

These are extremely versatile telescopes – while they are fantastic low power wide field scanners yielding a maximum field size of around 7 degrees, they also effectively provide magnifications that top out around 120-140x.

While 66mm is a very small amount of aperture it's amazing what you can see with it - providing of course, you know what to look for. These ultra small telescopes require almost more of a binocular mindset (although granted it's more of a binocular that can vary its magnification from 7x to 140x). I'd recommend that owners of these types of telescopes take a look at the book "**Binocular Astronomy**" by *Crossen and Tirion* – think of it as a Burnhams Celestial Handbook for binoculars with a copy of Tirion's Bright Star Atlas included in the back.

In regards to their maximum magnification - while they could be pushed higher, and it certainly was fun to do so at times, I never felt there was any more detail revealed. In addition, on anything other than the moon and bright planets, you tend to run out of light fairly quickly. Let's face it - 2.4" is not an overly large amount of aperture.

When viewing DSO's, I found I mainly used two different eyepieces - a 28 or 42mm 58 deg AFOV eyepiece from Olivon Optics (see the CN report in the eyepieces section for details on this line) whose light weight seemed to make them a perfect match for the 66's, and a 13mm t6 Nagler. These low power lightweight eyepieces made excellent finders and I found that most of the time, I didn't even bother with the WO RDF (red dot finder). The 13mm t6 presented a wonderful image which added enough magnification to study the larger DSO's in detail, while providing a nice, dark sky background and typically framing the object quite well. For those high power planetary and lunar views, I found I reached most often for my Nagler 3-6 zoom.

After given sufficient time to cool down, both scopes proved themselves to be of decent quality optically. No, they (for the most part) aren't Tak FS60C killers, but they are ½ the price – less if you include the accessories.

Several of us did get a chance to side by side the Tak FS60C with the WO 66ED triplet, and we felt that while the stars were a touch tighter in the Tak, we were quick to notice the WO's 10% aperture advantage, and all of us thought the views were quite comparable. While we all liked the Tak just a tiny bit better, we all agreed that for the money, the WO Triplet was a much better buy – at least for a visual observer.

While I didn't get a chance to side by side the doublet with the Tak, I feel it's very comparable to the Triplet in most areas, and as far as these particular samples go, may actually have slightly better optics overall.

Both 66's provided good views of the brighter deep sky objects, luna and the planets. While there'd not be a lot of planetary detail available in a 66mm telescope, you can expect to see Saturn's rings, a few bands on Jupiter, and during the opposition, some of the markings on the surface of Mars.

Mounting Concerns

Your mount consideration, ironically, may be one of the more important sections of this article. Proponents of the “80mm as a minimum” argument often forget one crucial component – you have to mount these guys. A 66mm scope (especially the doublet) is typically lighter than an 80mm – this means you can get by with a substantially smaller and lighter tripod – not an unimportant concern if you are looking for the ultimate in portability.

There were three mount setups that I used during the review period - the first being the MicroStar Deluxe mounted on two Bogen tripods (3001 and 3036). In my opinion, this mount has several advantages to other lightweight travel mounts on the market. First off, it's fairly inexpensive; secondly, it's very lightweight and compact. The dovetail plate that comes with the deluxe version not only allows you to swap scopes quickly, it also allows you to balance the Optical Tube by sliding it backwards and forwards in the mounting, and it's compatible with the GP/CG5/LXD standard. Its one disadvantage (at least in use with the doublet) is that the doublet was so short, I couldn't take advantage of the rotatable focuser to put the knobs in their usual position, and wound up with the focus knobs in a vertical position (this might be possible with a shorter dovetail). While I wasn't initially all that hot on this arrangement (it's funny what we get accustomed to), after a minor mental adjustment, this proved to be much smaller an issue than I had thought. The triplet, being two inches longer and with a different weight distribution, did not have this problem.



*The Triplet and Microstar take a business trip to Mexico
Image Courtesy Gary Gibbs*

While it's not the best way to mount these scopes, due to their extremely small size and weight, you could also mount them on a small photo tripod. I will note that due to its smaller size (2" shorter) and slightly lighter weight, the doublet rode much better on the standard photo tripod. I wouldn't want to use it at high power in that arrangement, but up to about 50x or so with a fairly wide field eyepiece it worked acceptably well.



Left - triplet, Right - doublet

The third option I used was the new WO EZ-Touch mount which can be seen in several of the pictures accompanying the article. I recently acquired this mount, and will be offering some comments on it in an upcoming review of the William Optics 105 triplet. Let's just say that if you are looking for an alt/az mount in the \$500 class range (w/ tripod) this is an excellent contender. About its only drawback is in its apparent lack of ability to mount encoders for those desiring computerized pointing. However, since you'll mainly be using this mount for scopes 4" and under, this really isn't that big of an issue.

Sidebar - A Word on SD and ED glasses:

The terms ED and SD were (to the best of my knowledge) invented by the camera companies a couple of decades ago. Both describe a family of glasses with abbe numbers in the (approximately) 70 plus range. Both were initially used as marketing terms to indicate to the consumer that there were glasses contained in the lenses which had Extra Dispersion or Special Dispersion properties to better control chromatic aberration. Today, while the term in use is generally ED, SD is as far as I am aware, perfectly acceptable – if a bit uncommon – at least in the US. The most often used ED glasses in today's scopes have abbe numbers generally on the level of FPL-51, FPL-52 or (most commonly) FPL-53. You should note that these really aren't the names of the glasses – they are catalog numbers. They will vary depending on which supplier you get it from. While the glasses from different suppliers may not be exactly the same, they are usually fairly close. If

you're interested in the different companies offerings, you may wish to check out **GlassBank** – a very nice resource for the amateur - <http://glassbank.ifmo.ru/eng/>

One final note – there's been a lot of discussion comparing an FPL-53 type glass to fluorite, and it comes complete with a number of several common misconceptions. The only statement I'm going to make on this topic (at least in this article) is that FPL-53 (or an analogue from a different company) is nearly visually indistinguishable, and lastly I'll point out that the abbe number for fluorite is just over 95, while that of FPL-53 is just slightly lower. For comparison, FPL-51 is around 81, and FPL-52 around 90. It should be noted that WO at this time has not stated definitively which glasses are used in their telescopes.

Photographic Performance

Visually, I tend to prefer doublets. But a triplet, in theory, should be a better photographic performer. With this in mind, a few friends and I undertook the task of trying to get a handle on the photographic performance of the triplet.

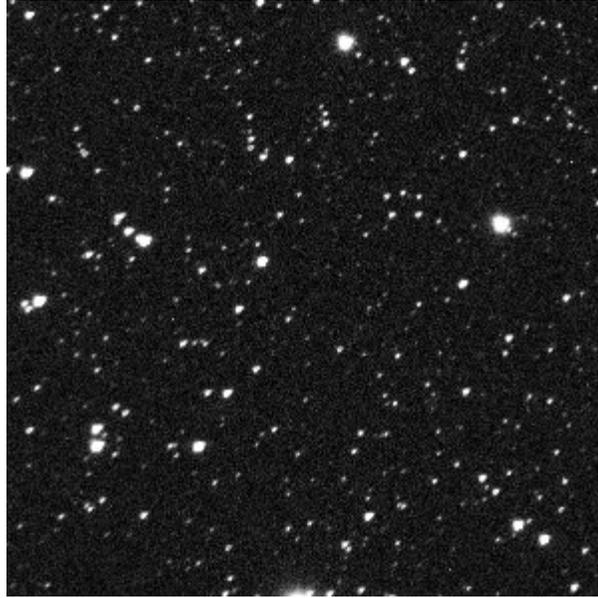
There has been some debate about a finished photo's ability to truly represent the capability of the lens – some think that you can't tell much if anything about how the telescope performs from a final image. Frankly, I disagree. I don't care how much post processing went into the shot, the pretty pictures that come out of that telescope are representative of its final potential as a photographic lens. You may have to perform a lot of manipulation to get it to that point, but the images show what's possible for a given telescope.

However, after considerable discussion, I decided that it would be more instructive to offer a raw, completely unprocessed photo – straight out of the camera. Those seeking finished photos can find them in various locations on the net. For this test, Joe Bruessow, a good friend of mine - offered to take the following image.



Sample Image - Resized

We're looking at an image of M35 and its companion NGC2158. This is from an ST-2000XM, with a KAI-2020 sensor (1600x1200 pixels), unbinned, with an exposure length of 1 minute. This image has had nothing done to it in terms of processing - not even dark frame subtraction.



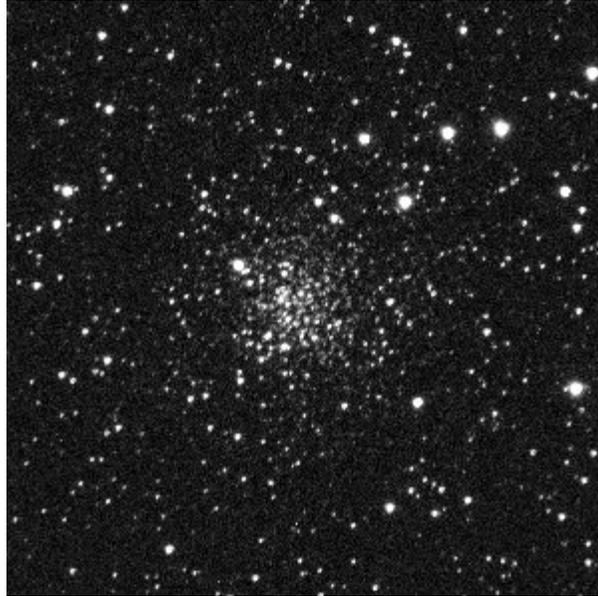
Corner Performance - 100%

I've resized it and converted it to a jpeg so it can be displayed in the article, and have cropped a corner and the center of the image to display at full size so the reader can see the effect of field curvature at its worst points and best points.



Center Performance - 100%

The chip used is a medium sized sensor. Field curvature would most likely be more severe if a larger chip was used.



NGC2158 Crop - 100%

In the NGC2158 crop above, note the resolution and number of stars - IMO, it is pretty amazing what can be done with such a short exposure and small telescope.

Another good friend, Jeff Thrush, provided some analysis of this image and supplied the shown visualizations of field flatness by using CCDInspector. I'm deliberately choosing not to include the specific numbers here because of the fact that we were somewhat limited in time due to weather constraints.



CCDInspector Visualization of the triplet's field flatness - Angle 1

We agreed that the actual numbers generated by CCDInspector were somewhat suspect in this case; most likely due to several issues including poor seeing as well as less than perfect guiding and focusing. Time restrictions limited our ability to continue testing.



CCDInspector Visualization of the triplet's field flatness - Angle 2

My thanks go out to both Jeff and Joe for their assistance in this matter.

From what I understand there has been some experimentation with SCT field flatteners / focal reducers – given the back of these scopes is threaded for SCT accessories, this seems an obvious thing to try. For more details on how these work with the scopes, as well as some samples of fully processed astrophotos, try checking the William Optics Yahoo Group or our own forums.

Although we concentrated mainly on the triplet for seemingly obvious reasons (to us at the time anyway), I'd like to eventually amend this article with similar data about the 66 SD Doublet. Assuming, of course, that time and circumstances permit.

So – which would I pick?

Well, I'm a visual observer through and through and with these types of scopes, I'm looking for the ultimate in portability. I want something as small and as light as possible. Plus, as a visual observer who has probably used more than his fair share of refractors, I've found I tend to prefer doublets as a general rule. I often find they have a tiny bit more pop/contrast/image sharpness than a comparable triplet. They also tend to cool down a bit quicker. True, the color correction usually isn't quite as good as in the triplet, but it's good enough for (my) visual purposes. Others may feel differently, depending on their own preferences. Choosing between the WO66 Doublet and Triplet, given the smaller size (although not by much), lighter weight (although not by much), the standard 2-speed focuser, and lower cost - I'll personally take the doublet for visual use. If I wanted slightly improved color correction, I'd opt for the Triplet.

Final Words

While the optical quality is not *quite* up to Tak or TV standards (it's close though), these scopes are about ½ the cost or even less, if you consider they come with very nice cases as standard equipment, and the fit and finish is quite nice.

If you're in love with small refractors, looking for an ultra portable apo, or want a dual purpose birding / quick look astro scope, then for these prices – they are nearly no brainers. Because of the very small aperture, I wouldn't recommend this as an only or a beginner telescope. For that I'd still recommend a 6 – 8 inch dob.



Fit and finish on both scopes is excellent, typical of WO products.

Finally, a word about WO, their philosophy and their telescopes in general might be appropriate.

With all the raving that's going on about WO scopes and equipment lately, someone might get the wrong idea about where their products lie in the market.

William told me at NEAF last year that his goal was to make good quality optics available at reasonable prices to the average astronomer. Apo's are expensive - he wants to make them affordable.

Don't pick one of these up expecting an optical Tak killer, or the refined in-depth design elements of a Tele Vue or other top dollar design. If you are the type of person who demands absolute perfection, you'd probably be better off on the AP list. Don't get me wrong, the WO's are great scopes, but I've talked with David (NA Rep) extensively about this, and (with a few exceptions - the FLT-110 comes to mind), in my opinion, WO really isn't trying to hit that market. What they are trying to do is provide an excellent bang for the buck. They are shooting for the middle market - in short, they're not going for perfection, but for "good enough". And from what I've seen, they are pretty much right on target.

The WO 66 Triplet and SD Doublet are a couple of very nice little scopes at prices that won't break the bank, and come recommended for those seeking the ultimate finder, a versatile travel scope or an ultra light grab and go.

William Optics

<http://www.william-optics.com>

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And dealers worldwide.