REVIEWED

VIXEN VMC110L

Vixen's quirky Maksutov

▲ The Vixen VMC110L telescope. Image: Vixen Optics.

Is the smallest telescope in Vixen's modified Cassegrain range a viable grab-and-go alternative to conventional catadioptric instruments of similar aperture? **Ade Ashford** finds out while exploring the rich history of the Cassegrain telescope.

At a glance

Design: Maksutov–Cassegrain with sub-aperture meniscus
Aperture: 110mm
Focal length: 1,035mm
Focal ratio: f/9.4
Optical tube mass: 2.1kg (4.6lb)
Tube length: 360mm
Finder: red dot
Visual back thread: 42mm for T-mount and 1.25-innch push-fit on the flip-mirror port
Resolution: 1.05 arcseconds (Dawes' limit)
Limiting visual magnitude: approximately +12
Highest practical magnification: approximately 150× (seeing conditions permitting)
Price: £395
Details: vixenoptics.com

Finances permitting, keen astronomers often gravitate to a small stable of telescopes chosen to suit the kind of observation they are making, in much the same way that a photographer will acquire an assortment of prime lenses for wide-angle views, portraits or telephoto work. Tooled-up stargazers generally favour the triumvirate of reflector, refractor and catadioptric. The first might take the form of a large-aperture Dobsonian for gulping in starlight when observing faint denizens of the deep sky, while an unobstructed aperture ED (Extra-low Dispersion) refractor is the weapon of choice for imaging or high-power, contrasty lunar and planetary views. Yet what of the third option, the catadioptric?

> ***The VMC110L's compact size and modest weight make it a good travelling companion***

noise, albeit well distributed around the Airy disc of bright stars. The Moon was rendered in beautifully crisp detail, but the VMC110L topped out at around 150×, beyond which the views softened noticeably in both telescopes.

Conclusions

The VMC110L fills an aperture and weight void between popular 102mm (four-inch) and 127mm (five-inch) aperture Maksutov–Cassegrains of conventional design possessing focal ratios of f/12 to f/13. On the minus side, the VMC's open tube means that contaminants will eventually settle inside the instrument, but no more than one would expect with a Newtonian. However, unlike a Newtonian, the VMC's mirrors are only accessible by dismantling the telescope. In contrast, the internal optics of a conventional Maksutov–Cassegrain telescope will remain largely pristine throughout its life and, when eventually required, the front meniscus lens is easy to clean.

While the VMC110L's compact size and modest weight make it a good travelling companion, you might wish to consider your Schmidt– or Maksutov–Cassegrain options if your observing site is particularly dusty. Dust concerns aside, the VMC110L otherwise feels as rugged as a regular Maksutov–Cassegrain or small Schmidt–Cassegrain telescope.

On the plus side, the VMC110L is optically faster (f/9.4) than similar aperture Maksutov–Cassegrain telescopes, hence with any given eyepiece it delivers lower magnifications and broader fields of view than the competition. Vixen periodically offers the VMC110L bundled with a Mini Porta mount as an attractive and practical grab-and-go kit, but when offered as purely an optical tube at close to £400, it pays to bear in mind that you can obtain a 102mm Maksutov–Cassegrain telescope on a computerised mount for a similar price. Much as I wanted to like the VMC110L because of its slightly unconventional optical design, looks and portability, the unnecessarily thick curved secondary mirror supports noticeably degrade an otherwise fine optical performance.

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▲ A tabbed lever (lower left) at the rear of the telescope tube repositions an internal flip mirror to give the VMC110L two viewing configurations: a right-angled 1.25-inch eyepiece port on the top, or a straight-through view on axis. The focus knob (upper right) is somewhat oversensitive and requires a deft touch. A standard Vixen dovetail (right) attaches in two ways to suit your mount, while a conventional Vixen finder shoe (upper left) ensures compatibility with a wide range of red-dot and optical finders. Image: Ade Ashford.

The history of the Cassegrain telescope

The French priest and polymath Marin Mersenne appears to have been the first to describe a folded two-mirror telescope, in 1636. His design, which was never built, employed a small convex secondary mirror located above (and co-axial with) a larger concave primary mirror, the latter having a hole in the middle so that light from the secondary passed through to a final focus.

History credits another French Catholic priest, Laurent Cassegrain, with the invention of the telescope design that bears his name, in 1672. A classical Cassegrain reflector requires a perforated primary mirror (i.e. a mirror with a gap for light reflected by the secondary mirror to pass through to the eyepiece) ground and polished to a concave paraboloidal shape, facing a smaller convex hyperboloidal secondary – identical to Mersenne's two-mirror design except for the shape of their surface geometries. In subsequent centuries, opticians experimented with mirrors ground and polished to different conic shapes in an attempt to simplify the Cassegrain manufacturing process and boost optical performance. George Willis Ritchey and Henri Chrétien made the first Ritchey–Chrétien Cassegrain in 1927, which has proven to be an enormously popular and successful design.

The first to create a Cassegrain telescope with spherical mirrors, yet eliminating spherical aberration, was the German optician Bernard Schmidt in 1930. He placed a thin aspheric window, now referred to as a Schmidt corrector plate, in front of the telescope. The elegant Schmidt–Cassegrain telescope employs optical origami to concertina an f/10 focal ratio instrument into a tube one-third to one-quarter its focal length. What's more, the secondary mirror is attached to a hole in the centre of the Schmidt corrector plate, hence there's no other supporting structure to produce diffraction spikes.

The second person to provide a means of eliminating spherical aberration in an all-spherical mirror telescope was the Russian optician Dmitri Maksutov, who filed a patent in 1941. Rather than a complex aspheric corrector plate, Maksutov envisioned a weakly negative and spherically curved meniscus lens with its concave side facing outwards at the front of the telescope. A small aluminised reflective spot at the centre of the meniscus' convex side forms the secondary mirror, reflecting the light back through a hole in the centre of the primary mirror.