Re: close focus formula

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- *From*: Tenifer <tensorsurfer@xxxxxxxxx>
- *Date*: Sun, 11 Nov 2007 02:32:39 −0800

On Nov 11, 6:08 pm, Roger Hamlett
<rogerspamigno...@xxxxxxxxxxxxxxxxxxx> wrote:

> On Sun, 11 Nov 2007 00:37:00 −0800, Tenifer <tensorsur...@xxxxxxxxx>
> wrote:
>
>> On Nov 11, 12:04 am, Roger Hamlett
>> <rogerspamigno...@xxxxxxxxxxxxxxxxxxx> wrote:
>>
>>> On Sat, 10 Nov 2007 04:09:53 −0800, Tenifer
>>> <tensorsur...@xxxxxxxxx>
>>> wrote:
>>>
>>>> On Nov 10, 1:58 pm, dkel...@xxxxxxxxxxx
>>>> wrote:
>>>>
>>>>> On Nov 8, 6:48 am, Tenifer
>>>>> <tensorsur...@xxxxxxxxx>
>>>>> wrote:
>>>>>
>>>>>> On Nov 8,
>>>>>> 6:49 am,
>>>>>> dkel...@xxxxxxxxxxx
>>>>>> wrote:
>>>>>>
>>>>>>> On
>>>>>>> Nov
>>>>>>> 7,

12:28
pm,
Tenifer
<tensorsur...@xxxxxxxxx>
wrote:

On
Nov
8,
3:24
am,
dkel...@xxxxxxxxxxx
wrote:

On
Nov
6,
8:40
pm,
Tenifer
<tensorsur...@xxxxxxxxx>
wrote:

There
was
this
scope
which
can
focus
object
less
than
a
meter
from
the
object
and
you
only
have
to
move
the

focuser or mirror a little bit. It was the MTO 1000 focal length f/10 4" russian maksutov scope. I compared it with a 70mm F/8 560mm focal length refractor and i have to move the focus back one foot to achieve close focus 2 meters away (in the refractor). Is there

a formula wherein I can calculate the exact back travel of the focuser to achieve focus of the target say 2 feet away from the objective of this 70mm f/8 560 focal length refractor given a 15mm plossl with magnification of 37X? I used paper rolled into tube to extend the

back
focus
a
feet
or
a
meter
away
from
the
refractor
rear
but
I
can't
achieve
focus.
Also
why
is
the
maksotuv
able
to
focus
at
one
feet
by
just
moving
the
back
focus
a
little
bit
like
an
inch??

Teni

Hi
The
refractor
can

be
treated
as
a
simple
lens
for
this
purpose:

F.L.
=
1/(1/D1+1/D2)

F.L.
is
the
focal
length
of
lens
D1
is
the
distance
from
the
object
to
the
center
of
the
lens
D2
is
the
distance
from
the
lens
to
the
eyepiece.

The focal length of the eyepiece doesn't need to be involved. The distance from the lens is measured to the field stop in the eyepiece (usually where the eyepiece makes the step to the larger diameter but may be in front of that some for short focal length eyepieces).

The Mak's primary is moving, as another mentioned. Since the primary is a short focal length, smaller amounts of movement are needed to move the focused image. It follows the same rules or fomula as the simple lens. What the Mak has that the refractor doesn't is that it

also has a secondary (the coated surface on the meniscus). This is used to effectively extend or multiply the focal length of the primary. Most astronomical telescopes will have some issues with close focus because they are designed to work with a light source that provides parallel light beams

from each point of the object. In a reflector, they'd use a parabolic surface to focus. If it was designed for a shorter focus, an elliptical surface would have been used. What this means is that one can not achieve a sharp focus when using such an astronomical telescope for close

viewing.

In the case of your refractor, you'd need to extend the focal point 0.217 meters (777 − 560) to focus at 2 meters, as calculated from above. Dwight− Hide quoted text −

You mean in the refractor. Even if I used 15mm

or 7mm eyepiece, I can get the same image magnification when focusing at 2 meters by racking back the focuser 0.217 meters??

No, I mean the focal distance isn't related to the eyepiece. The magnification is still the primary focal length divided by the eyepiece focal length.

This is new.
So it means
I can
change
eyepieces
from
3mm to
25mm
without
changing or
racking out
the focuser
provided I
initially got
it to the
right focal
distance
(distance
from lens to
eyepiece)
from the
close−up or
single lens
approximation
formula?

No eyepiece that I've seen is
made perfect but switching
eyepeices should only
require small readjustments
to
get back to focus, assuming
the object hasn't moved
relative to the objective lens.
I've seen some eyepeices
that might be as much
as 3/4 inches off but that is
the exception.
Plane of focus of the
objective doesn't move. The
eyepiece
just looks at this plane by its
effective focal length. This
is
suppose to be where the
field stop is but like I said,
no eyepiece is perfect. The

amount you'd change the
focus would be the same for
a close object, between
eyepieces, as it would have
been for looking at a star.
If the two eyepieces
required one turn of the
focuser knob
for a star, it would be
exactly the same for a close
object
(not totally true, this
assumes your eye is focused
at
infinity and most eyes are
not but it shouldn't be
enough
difference to notice).

Do you
know the
boundary or
distance
when the
rays shift
from
parallel rays
(from
infinity) to
when
it starts to
bend (from
closeup)?
How do you
calculate for
it?

I'd expect it would depend
on how fussy one was.
If it were a problem,
stopping the objective down
should help.
Dwight

Maybe you know the answer to this question that
astronomy scope users may not able to answer
because they only focus at infinity and can't imagine
getting close to infinity which can't be calculated.

Given say a close focus of 37X magnification at a
distance of 2 meters between object and objective lens.
What magnfication must be used when the distance
become mere 6" from the object? Scope is a 70mm f/8 560 focal length refractor using 15mm EP.
Do you know what formula can be used in the above.
Thanks.

The fornula for a simple refractor, is the standard lens formula:

$1/u+1/v = 1/f$

'f' here is the focal length of the refractor. 'v', and 'u' are the distances to the focal points, in front of, and behind the lens. When
focussed at 'infinity', the term for this becomes zero, so you are
left with the distance to the focal point behind the lens, being the
same as the focal length. So:

$1/u +0 =1/f$
Hence u=f.

Now for the object 2m in front of the lens, you need to solve for u,
so you get:

1/u = 1/f − 1/v

With f=560mm, and v=2000mm

1/u = 1/560 − 1/2000

This then gives 'u' = 777.77mm from the lens. Compared to the focal
point for the stars, you will need to move the eyepiece 'out', by
217.77mm. So you need something like an 8" extension tube, to have any
hope of focussing the scope.

Best Wishes− Hide quoted text −

− Show quoted text −

I know the above. But I can't seem to get the relationship between field of view and magnification. Say I use the 70mm f/8 560 focal length refractor at a target 6 meters away using 37X. If I'd get nearer to the object at 2.5 meters. How much magnification I must use to see the SAME DETAIL or RESOLUTION (sorry for the capitalization as it is to emphasize it). It has to do with field of view as one gets nearer the object but what is the exact formula to calculate it??

This principle would finally make me decide whether to get a 4" maksutov or retain 70mm for long distance microscopic work such as viewing ant or bee colonies.

teni

It is simply linear.
A 'rule of thumb'. At 100yards, 1", is 1 minute of arc.
If you had a 'view' of something at 10 yards away, that is 1" across, it is 10 minutes of arc, 'naked eye'. If you use 40* magnification, you will 'see' it as covering 400 minutes of arc. If you instead move it to 100yards away, you will have to use 400* magnification, to see it as the same size.
Now, there are caveats on this, because of the diffraction effects and atmosphere, the object will _not_ show as much detail at 100 yards away, and 400* magnification, as it would at 1/10th the distance, and 1/10th the magnification, but it's apparent size, _would_ remain the same.

So it's proportional. If the 70mm f/8 refractor at 6 meters from the object at 40X magnification is put 3 meters from the object, the magnfication simply needs to be 20X see the same detail. Agree?

Going back to the 4" maksutov vs 70mm refractor in long distance microscopy. This means the maksotuv at 4 feet (nearest that can focus from the 1 meter focal length) would produce twice the magnificaiton possible in the 70mm refractor at 8 feet away. Therefore the 4" maksutov wins in long distance microscopy because you also get a brigher image because you are using the mirror to focus and not extending it to the eyepiece end.

But a complication. I wonder what's the true magnification in the mak (or SCT) since one is moving the primary mirror. So what one thinks as a magnificaiton of 50X in the Mak is not really 50X because the focal ratio changes and so the value in the (aperture x focal ratio) / eyepiece = magnification and I wonder how to calculate for it (put in a separate thread...)

Teni

Best Wishes− Hide quoted text −

− Show quoted text −

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