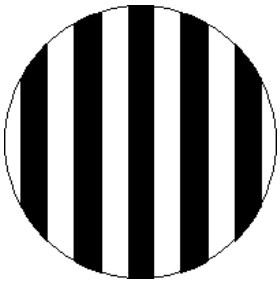
Ronchi Eyepiece

Congratulations for your new Ronchi Eyepiece!

This handy new accesorry will give you major help to check the quality aof nearly any scope you´re coming along in the future!
Basically all abberations of an optic can be seen in a Star Test[1,] but this requires very steady air and lots of experience by the observer! Compared to the Start Test the Ronchi Test works also with medium air and also a Beginner will be able to do a correct Analysis of an instrument after a short period of learning!

Purchased parts package:
The Ronchi Eyepiece consits of a mainbody made of black anodized aluminium. In the inside there is a small piece of glass with aon it. Some Gratings from other manufacturers are made of exposed film or laser printouts: Those gratings will show inferior contrast and will be much more difficult to analyse! This Ronchi eyepiece is equiped with a vacuum metalized chrome on glass grating with 10 lines per millimeter. The grating is on the telescope side of the glass and is exactly in the same plane as the outer stop.
The Ronchi Eyepiece is shipped in an protective housing with a short manual in english and german. (It´s not possible to give a complete general survey of all details of the Ronchi Test. There´s a list of sources for further reading below.)

Quickstart:
Please point the instrument to be tested on a medium to bright star (An artifical star also works well). Move the star to the center of view and focus. Change to the Ronchi Eyepiece and move your focus to place the grating a very small amount out of focus. You´ll see the bright disk of your lens or mirror wit a number of superimposed lines on it:



Be comparing the lines to the graphics on the other side of the page you may do a detailed analysis of nearly all abberations.
The smaller the number of stripes, the more sensitive the test! When placing only three stripes accross the disk, only very few optis will pass as "perfect"! A inferior optic will show a nice compilation of errors with ten lines across the surface. (Don´t use it at night, I won´t make fun!)

Using a grating with 10 lines per millimeter and approximately five to six stripes is an international quasi-standard for testing amateur telescopes. If the instrument in question will show no errors in this setup, it will give you lot´s of fun at night! The sensitivity is increased very much by moving the lines (f.e. with your DEC motor) across the disk. Small deformations can´t be seen more easy than in a static image.
When you want to compare or discuss the ronchi image with others (or with an manufacturer), allways use the intrafocal image!

The table on the other side shows you the Ronchi images of all major optical abberations. Usually you won´t see a single error but a nice combination of them. This might result in a more difficult interpretation, but as you gain some experience you be able to see the dominating error fast! Some errors (f.e. Astigmatism) can only be detected by comparing the intra- and extrafocal images. To do this, please move you focus by very small amount inside and outside the focus and compare the images!

Cleaning, Service, Adjusting:
The Ronchi Eyepiece is a very easy construction. There are no moveable parts, nothing has to be adjusted. Please avoid touching the grating with your fingers: The grease will result in low contrast images! If you have to clean the grating, please use a Q-tip with medical alcohol and/or a (good!) microfibre cloth.

further reading:
[1]Suiter, H.G. STAR TESTING, 2008, Willmann-Bell
[2] Malacara (Ed.), Optical Shop Testing, 1992, Wiley-Interscience
[3] ATM-Wiki, www.otterstedt.de/wiki/index.php/Ronchi_Test

further details can be found at:
www.gerdneumann.net

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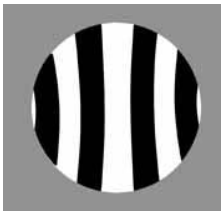
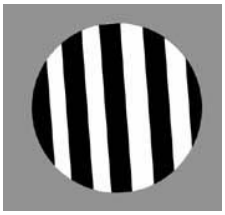
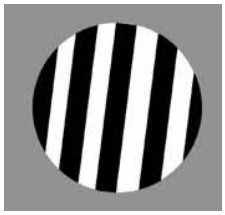
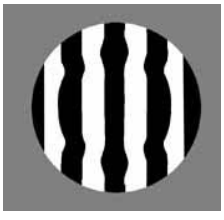
Ronchi Images of major optical abberations

Intrafocal	Extrafocal	Optical abberation and explanation
		**Perfect Optics** As it should look like... Perfect! A perfect optics will show you straight and parallel stripes without any deformations on both sides of the focus! Each instrument showing this Ronchi image will give you lot´s of fun and show perfect stars and planets. Such optics are very rare!!
		**Spherical Overcorrection** Off-axis rays have another focus than on-axis rays. There can be seen many diffration rings when focused! You have a very bad contrast when observing! Any telescope which will be used for planetary observation should not have any sperical Over- or Undercorrection: You won´t have much fun with it! Parabolic mirrors may have a slight sperical Overcorrection, as many coma correctors intruduce sperical Undercorrection. Both errors might erasel each other out.
		**Spherical Undercorrection** Same situation as above with changed prefix! Very bad contrast when observing planets! Lots of fast optics for astrophotography show a slight sperical abberation. Due to the scale of the images that doesn´t matter too much. (You´re far away from the theoretical limits of your optics!) Lot´s of comacorrectors introduce some sperical undercorrection.
		**Turned down edge** A lot of mirrors show a turned down edge. Especially cheap optics suffer from this problem due to the (too) fast manufacturing . Off-axis rays have another focus than on-axis rays. As the outer ring has a huge surface there is a major impact on the image quality. Pure "light buckets" for Deep-Sky observation can be used with a TDE, but when observing planets the outer ring should be blocked by a round cover plate. - The image will be much better!
		**Central elevation** A very common mistake, seen it a lot of optical systems! Due to the small surface this error has only a minor impact on image quality. (MUCH less than a TDE!) When persent in syetems with a central secondary mirror the effect is even less, as the elevation is mostly behind the shadow of the secondary!
		**Central depression** Same situation as with a central elevation but with changed prefix! Minor effect on image quality.
		**Astigmatism** A common and very nasty error! This error can be seen in a Star Test very easy: Die diffraction disk is eliptical and swaps by 90° when moving through the focal plane. The efect on the image quality is dramatic! Even a small astigmatism will spoil the party! At some instruments astigmatism can be corrected by a carfull adjustment (RC, Maksutov, SC), but usually astigmatism is a reason to return a instrument to your dealer! Astigmatism might also come from a zenith mirror of minor quality!
		**Zonal aberration** Nearly all optical surfaces show zonal aberrations. Good ones are only very weak and difficult to detect, bad ones are strong and clear! A small zone on the inner part has a minor effect, a strong, broad zone on the outer part has a major effect. A really bad optic will show a TDE, a central elevation and some zonal aberrations. Optics like this are called "Rasierspiegel" (Shaving mirror) in german... They are not suitable for astronomical use.

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