



Leica R-Lenses

by Erwin Puts

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Chapter 6: 15 mm lens

__ LEICA ELMARIT-R 15 mm f/2.8



__Introduction

The 15mm focal length offers an angle of view of 100 degrees in the horizontal direction. I prefer to use the horizontal angle and not the diagonal angle of 111 degrees. We look through the viewfinder and holding the camera in the normal position, we usually assess the scene from left to right. That is how we compose the picture and then the horizontal angle of view determines our choices. Some years ago, a lens with a 17mm focal length would be the limit for high quality photography. Beyond this limit we could find the so-called fish-eye lenses. If we push the retrofocus wide angle design to its extreme, we can cover a field of 180 degrees and more. The front element must be very strongly bent and we must create very heavily overcorrected spherical aberration to let the oblique rays pass through the aperture stop. Doing this, we also introduce a large amount of barrel distortion.

What is acceptable or even necessary for a fish-eye lens with a circular image, is not possible for a lens that needs to cover a rectilinear field with accurate proportions. The designer has a very difficult job to control the aberrations and it is here that the use of aspherical surfaces can be highly effective. The first serious discussion about the principles of aspherical (non spherical) surfaces can be found in the work of Descartes in 1638. The first calculations of aspherical surfaces are proposed by Huygens in 1678. In the beginning, the research was focussed on the correction of spherical aberration, but nowadays aspherical surfaces are employed for the correction of all kinds of aberrations and for the reduction of physical size of a lens.

Useful as they are, the production of aspherical lenses requires a very high level of accuracy. It is normal in optics to use the value of a quarter of a wavelength as the tolerance level for the accuracy of the shape of a lens. A quarter wavelength is about 1/1000th of the thickness of a human hair. The demands on the quality and precision of manufacturing are very high.

With the use of aspherical surfaces and better techniques for the correction of aberrations, the focal length of 15mm is not a technical limit anymore. Looking at the world market we discover lenses with focal lengths from 12mm to 14mm, some of them very good. These designs have to be admired for their generally high image quality.

The question here is not that such an extreme wide angle is feasible, but where the limit of usability lies. The wide angle perspective, as noted in earlier chapters, becomes quite strong. With a 12mm lens the central push of the image and the horizontal elongation of subjects at the outer zones of

the lens are quite visible. This effect may be so strong that persons, located at the edge of the frame become victims of apparent obesity.

With a focal length of 15mm, the photographer enters the realm of specialist lenses. Its special characteristics support eye-catching pictures and compositions, but the lens cannot be used for every type of picture and object. In the past, specialist lenses often had a lower image quality and could be excused because of these characteristics. Today this is not possible. No photographer would accept that some pictures in a show would be clearly distinguished by a much lower performance.

It might be interesting to compare the image quality and information gathering capability of a few lenses to see where we stand in the optical landscape. The following values have been calculated by a very complex formula. The base of the calculation is the optical transfer function (OTF). This is the overall measure for the image quality. The MTF (modulation transfer function) is part of the OTF. The OTF is more complex and can only be grasped by optical designers. Based on OTF values, the spatial frequencies at which the modulation falls to 50% (excellent value) and 20% (limit of normal visual perception) are noted at five positions in the picture area (from centre to corner). Then the picture field is divided in four circular zones.

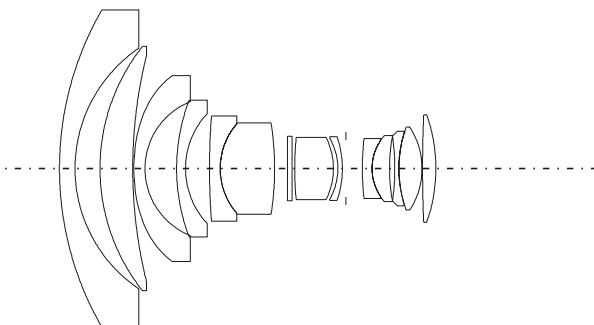
The area of each zone is computed. We now assign the spatial frequency values at 50% and 20% to each of the zones. Then we calculate by a complex formula the number of pixels at both modulation levels. The resulting single figure is a measure of the information gathering capacity of a lens. The higher the number, the better the lens is in this respect. The comparison is done for lenses to be used with the 35mm format.

The 15mm lens has a value of 3.39, an excellent 1.2/55 aspherical has a value of 4.22, and an excellent 28mm f/2.8 has a value of 7.28. The first lens is the original Schneider design, the second and third ones are from a major Japanese manufacturer. We should not read too much in these figures, but as a base for comparison we can note that the current 15mm lens captures the same amount of information as a high quality standard lens with a very large aperture. The 28mm lens can collect more details, but does this at half the angle of field. The trade off between angle of field and aperture can be clearly identified.

__LEICA SUPER-ELMARIT-R 15 mm f/2.8 ASPH



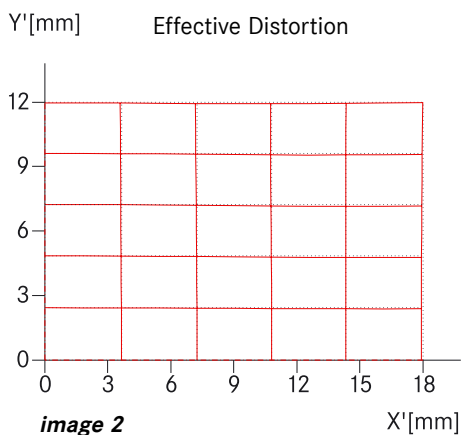
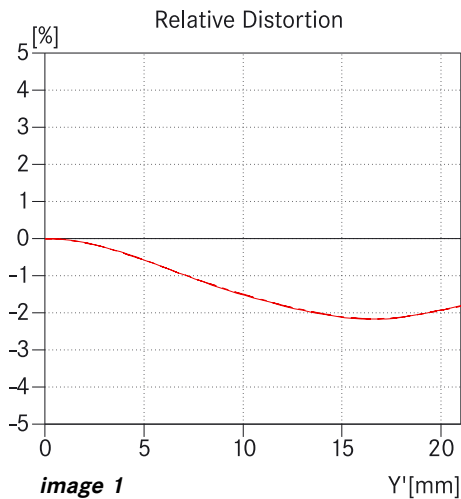
The Super-Elmarit-R 15mm f/2.8 ASPH is a state of the art design with 13 elements in ten groups, one aspherical surface and a floating element/internal focusing to improve performance in the close-focus range. The true focal length is 15.6mm (compared to 15.4mm for the predecessor, the Super-Elmar-R 15mm f/3.5).



Distortion is surprisingly low with a maximum of 2%. You may compare this value with the other wide-angle lenses, discussed in previous chapters (*see image 1*).

The maximum value is of less importance than the shape of the distortion curve. In the case of the Super-Elmarit-R 15mm the distortion is already visible from image height 4mm, where the Elmarit-R 19mm starts at 6 mm. But the bulging shape of the 19mm delivers a different distortion character than that of the 15mm.

Distortion is in general very well corrected and even persons at the edges of the image retain their normal body contours. (Ever looked at the elongated faces and bodies of persons when using a 12 mm or some other 15mm lenses?). Architectural straight lines are straight lines with a just visible distortion in the outer zones of the image.



The fish-eye lenses are lucky with the high distortion, as this offsets the vignetting. But in a normal 15mm lens, the distortion is quite well controlled and now the vignetting is more difficult to control (see image 2). The Super-Elmarit-R 15mm has a maximum vignetting of 2.5 stops, which is below the figure of the Noctilux 50mm. This comparison is again an indication that high performance lenses (high speed or wide angle) are still a compromise, but also that the general level of performance is very high. In the case of the Super-Elmarit, the illumination fall-off at aperture 1:11 is still one full stop. But we need some additional information to understand these figures. As with plain resolution figures, it is easy to be misled by quantification. The human eye is very insensitive to very small changes when they occur smoothly. The eye is trained to focus on abrupt changes and will neglect small differences. Of course one will see a darkening in the corner at full aperture where the vignetting is more than 2 stops. I have made many pictures

just to find out the effect of illumination fall-off and discovered that in many situations you do not see the darkening in the corners, even if you know it should be there. If we study the vignetting curves, you will see that the graphs for the smaller apertures are very smooth, a fact that helps to suppress the impression of vignetting. In darker grey areas it is not visible, but white areas or clear blue sky do show light fall-off. You can often hear and read about claims that an illumination fall-off of a half stop is already severe and unacceptable.

The behaviour of this Super-Elmarit-R indicates that such claims are not based on real life situations. In extreme wide angle lenses, some aberrations are not really problematic. Longitudinal chromatic aberration and secondary colour are for the most part only dependent on focal length and with this short length of 15mm, these chromatic errors are not important. The secondary spectrum of the lateral chromatic aberration is a problem as is the chromatic error in distortion. In short all chromatic aberrations that are dependent on focal length (the longitudinal direction or along the optical axis) are small, but all aberrations, depending on the angle of view or the height of the image (the lateral direction) can be quite severe. The remarkable performance of the Super-Elmarit-R can be attributed to the control of both types of aberrations. At full aperture we have a medium to high contrast image with excellent definition of fine detail over an image circle of 12mm radius (24mm image circle in diameter) (see image 3).

The outer zones and the corners lose their bite progressively, but even in the extreme corners coarse detail is well visible. The curves, representing the 5 to 20 lp/mm are in excellent shape and even the curve for the 40 lp/mm is quite good, but levels off to zero percent at the edges. The curve for the 10 lp/mm has a value of about 20% at the edge of the image, which is just visible. When reading this one should reflect on the extreme angle of field. For this angle the definition over the whole image field outstandingly good. A slight fuzziness at the edges of fine detail delineation softens the overall crispness of the image a bit.

Astigmatism and colour fringing are for all practical purposes non-existent. If you are doing really demanding work (above 50 times enlargements of slides), expect some colour fringing beyond the 9mm radius.

Flare is commendably low: secondary images can not be detected and the veiling glare in back-lit shots is confined to very small areas around the bright spots themselves. A good example is a picture of very fine telegraph or electricity lines against a light grey or white sky: if the lines are clearly differentiated and keep their own colour (no greying)

then the lens is OK. There is absolutely no decentring, which gives credit to manufacture and quality control given the large diameter of the lens elements.

At 1:4 the lens visibly crispens and the circle of best performance grows to 30mm (15mm image height), that is close to covering the whole format. Edges of fine detail now are clean-cut and overall contrast is high.

The typical Leica sparkle in the highlights and bright spots is evident and the fine differentiation of the whitish hues (on modern slide films) adds to the impact of the image. Further stopping down is not necessary, neither to optimise image quality, nor to increase the depth of field. Till 1:16 the lens can be used, but at apertures from 1:11 the overall image is softer.

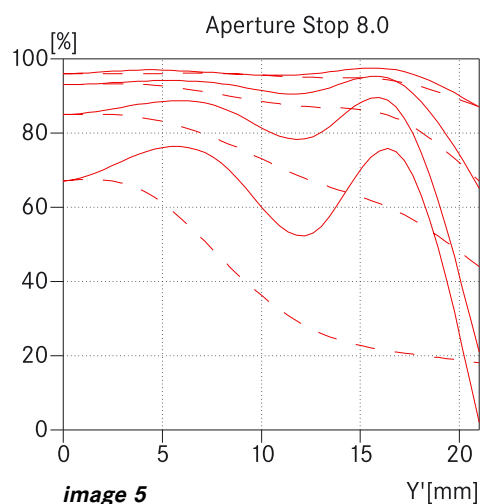
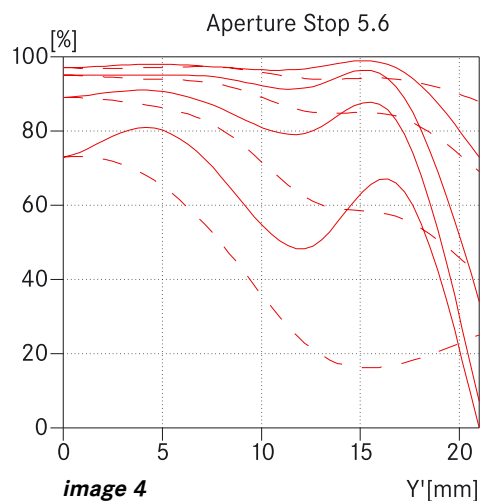
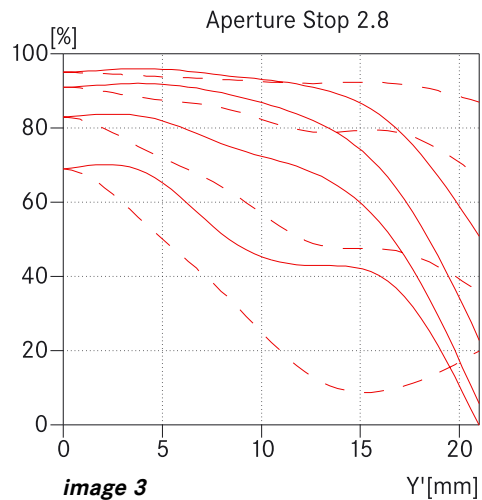
At 1:5,6 and 1:8. the lens is at its optimum and has that well-known Leica fingerprint of crisp and clean details with excellent clarity of shadow and highlight hues and outstanding colour reproduction, with a high fidelity reproduction of fine gradation of hues in small subject areas (*see image 4 and 5*).

The MTF graphs for these smaller apertures show a remarkable semblance to the one for aperture 1;2.8. You see a crispening at the higher frequencies and over a larger image area. But generally speaking the lens performs quite evenly over a large range of apertures.

At closer distances the contrast drops in the zonal areas outside a small centre circle. But stopping down to 1:8 brings the quality you need over the whole image area and you can expect the same performance as you will get at larger distances.

The Super-Elmarit-R is an original Schneider design. It is worth stressing that Leica did not accept the design as Schneider provided initially but commented on the quality and wanted a performance that is in line with the Leica philosophy. I have studied the original design and the major change is in the shape and curvature of the second lens element. Whoever designed and manufactures the lens is of minor importance, compared to the required performance parameters. The imagery is as Leica wants it to be, given their own goals and aspirations.

One cannot help to compare the new lens with its predecessor: the Super-Elmar-R 15mm f/3.5. This Zeiss design has less overall contrast at all apertures and especially the definition of very fine detail is much lower. The new Super-Elmarit-R design is quite crisp and clean in its detail rendition, which is the result of a better mastery of the higher frequencies.



As example: At 1:8 the older Elmar design has about 90% contrast in the centre for the 10 lp/mm. The newer Super Elmarit has above 95%, a difference that is clearly visible. Even more important is the 40 lp/mm: Elmar in the centre: 40% at 1:3.5 and 55% at 1:8 versus Super-Elmarit 65% at 1:2,8 and 70% at 1:8. This optical progress is quite visible in normal photography.

__Artistic considerations

The very wide angle of this lens and its short focal length bring advantages and restrictions. At normal distances the lens captures a large visual area in breadth and depth. At the shortest distance of 18cm, we can create a very interesting close focus view and perspective of an object engulfed by its environment. The extended depth of field makes the concept of 'boke' (unpleasant or fragmented representation of unsharpness) obsolete for this lens.

At aperture 1:8 and focus at 1 meter the depth of field extends from 0,5 meter to infinity. Even unsharp areas in front of and beyond the sharpness field ('plane' would be the wrong word here) retain shapes and details. The transition from sharp to unsharp is very smooth. The assumption that this focal length is an easy one for pictorial representation is wrong. This is definitely not a convenient landscape lens. The large and extended foreground push main subject areas into the vanishing background. So you need to be careful how and where to deploy the lens. It is at its best when the sense of depth and shape needs to be defined in space. It is also needed when the overwhelming impressions of magnificently decorated rooms, long corridors, interior buildings or narrow alleys must be captured.

The lens can be used with good effect when photographing groups of persons that are engaged in a common activity. Photographed from a close position and centre location, the picture gets a strong sense of visual dynamics and the spectator feels to be in the middle of the action. Almost tactile closeness to the subject, combined with the sense of extended depth give pictures with a 15mm lens an almost picturesque perspective.

The reference to painting is intentional. When you look closely at landscape paintings and paintings of groups of persons, you will notice that there is at the same time a sense of vastness because of depth illusion and wide angle perspective, but also a sense of intimacy as the major objects are positioned very close to the viewer. A visually sensitive photographer with a keen and empathic eye can do wonders with the lens.

(S)he can even create a new visual language with the 15mm. There is, in my view, no other lens in the R-stable that offers such exciting opportunities for novel imagery, based on careful composition and layout of objects and the play with perspective and sense of depth.

It is quite natural that with this lens the camera must be held level to avoid slanting lines. The accurate viewfinder masking on the R8/9 can be used very effectively to avoid tilting the camera. Just find a horizontal and vertical line in your motive and align the finder frame in one corner as close as possible as if you were using a straight edge. On the other hand, the oblique lines that appear when holding the camera in a tilted position can heighten the visual effect. When you are using the 15mm a lot, it is advisable to acquaint yourself with the rules of graphical perspective.

__Conclusion

The Super-Elmarit-R delivers outstandingly good image quality at all apertures. The best proof of the capabilities of the Super-Elmarit-R 15 is a close look at slides taken with this lens. You would not expect that these slides can be made with a 15mm lens. They are natural looking in their perspective and clarity. Fine details radiate when enlarging, projecting or looking closer at the picture. The colour reproduction is very natural and pictures with the Super-Elmarit-R show a distinguished colour palette that invites you to step into the picture and marvel at the quality of reproduction and the depth of perspective.

The mechanical quality is superb: the mechanism of internal focusing is indeed incredibly smooth in its movement. Accurate focusing with the normal screen is not so easy as the sharpness plane does not jump into focus as with the Summilux-R 35mm f/1.4. You have to rely on the split image mechanism, which only works with vertical lines. The internal filter revolver is the same as can be found in the previous Super-Elmar-R 15mm. A filter must be used as the filter element is part of the optical design.

The Super-Elmarit-R is a very fine tool for the photographer who wants to create pictures with a very strong visual impact and a wide dimensional scope.

