

modern tests

Performance

| Our Standard | Tested |
|--|------------------------------|
| Focal length: ± 5% (128¼-141¼mm) | 135.4mm |
| Max. aperture: ± 5% (f/3.8-f/4.2) | f/4.1 |
| Distortion: ± 2.5% (pincushion) | Less than 1% (pincushion) |
| Light falloff: at f/5.6 ± 1 stop from theoretical limit (-0.07 stops) | -0.16 stops. |
| View area compared to film area: (Vertically, at least 85%; horizontally, not more than 100%) | V: 92% H: 91% |
| Parallax error compared to film (at 7m): V: 0.96mm V: 0.25mm downward H: 1.61mm H: 0.4mm toward right | |

Resolution

at 1:49 magnification

| f/no. | Center Lines/mm | Corner Lines/mm |
|-------|-----------------|-----------------|
| 4 | Good | 39 |
| 5.6 | V/Good | 44 |
| 8 | V/Good | 49 |
| 11 | Excellent | 55 |
| 16 | V/Good | 49 |
| 22 | V/Good | 44 |

Contrast

at 30 lines/mm

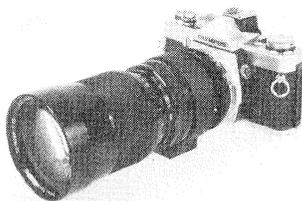
| f/no. | Center % | Corner % |
|-------|----------|----------|
| 4 | Low | 38 |
| 5.6 | Medium | 48 |
| 8 | Medium | 53 |
| 11 | Medium | 50 |
| 16 | Low | 45 |
| 22 | V/Low | 34 |

On the Optical Bench: We observed less color flare and less zonal spherical aberration than we might expect in a 135mm tele. No axial color was detected, and the central image became nearly diffraction-limited (the theoretical perfect image) when the lens was stopped down one stop to f/5.6. The point image on the optical axis appeared round, with no tail or one-sided flare to indicate any decentering or tilted lens elements. Off axis, the point image was observed to have only a slight astigmatism, but no lateral color or coma. A very small and faint skew ray flare was seen, but this vanished when the lens was stopped down to f/5.6. Overall, the lens should produce very good to excellent image quality. *In field test slides:* when this lens was used to take color transparency pictures, the images were found to be very sharp at f/4, and even better at f/5.6. There was little to choose between central and off-axis image quality. A slight softness and astigmatism became undetectable only ½ stop down from maximum aperture (f/4.5). Close-in images

were also very sharp and with excellent detail and contrast even in dark areas of the subject. We found a barely noticeable loss of sharpness at the extreme edges and corners when the lens was at f/4, but this improved at f/5.6. For a non-multicoated lens, residual ghosts and flare were very well controlled.

90-180mm f/4.5 VIVITAR SERIES 1 FLAT FIELD ZOOM

Mounts: Nikon, Canon, Olympus, Pentax, Minolta, Konica, Praktica screw thread
Filter size: 72mm screw-thread
Apertures: f/4.5 to f/22
Min. focus dist.: 68.5 cm (27 in.) for a 1:2 reproduction at 180mm
Features: VMC Multicoating, rotatable tripod socket, screw-in lens shade
Series no.: 222700858
Size: 75mm diam., 158mm long (3 X 6.2 in.)
Weight: 1.09 kg (38.5 oz.)
Price: \$599; may be available at a discount price



Flat field 2:1 zoom has continuous focusing down to a reproduction ratio of 1:2 (at 180mm).

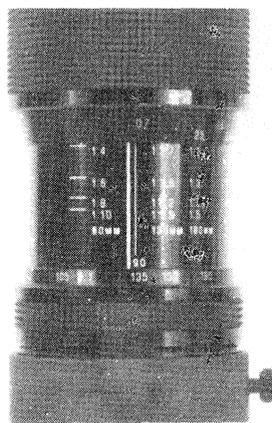
Practical Comments: This unique 18-element, 12-group zoom, designed to yield maximum quality at a 1:10 close-up position, had its origins in Vivitar's desire to produce a quality zoom lens suitable for medical photographers, who need maximum magnification at a great camera-to-subject distance. Among the specifications was extremely flat field coverage, to provide sharpness, center to edge, suitable for medical examination and analysis. It was first thought that such a zoom would have to be limited to close-focus only, but Vivitar's Canadian and U.S. optical engineers and their mechanical engineering counterparts in Japan managed to create a zoom that fulfilled specifications for both close-focus and distant work. Because the lens would have wider applications than medical work—nature and industrial photography to name just two—it was decided to rename the medical zoom "Flat Field Zoom" in line with its extended range of uses. As we mentioned in our article on so-called macro zoom lenses in the Jan. 1978 issue, concerning the 90-180mm f/4.5 Vivitar, "the maximum aperture by today's standards is small, the zoom

range limited, the lens not light, the length not short. Instead emphasis is on close-focusing quality and the lens' ability to produce fine rendition center and edge even for flat field copying work while maintaining an admirably great lens to subject distance."

With a 1:4 magnification, the front lens element, according to our field tests, can remain some 32 in. away from the subject at the 180mm focal length setting and half that distance at a half life-size magnification—highly useful long distances whether photographing open heart surgery or a bee pollinating a flower.

Certainly no close-focusing zoom operates more conveniently—there are no special zoom rings to turn or buttons to push to reach the close-focusing mode. The front focusing ring controlling the movement of the front four lens elements has a 1½-in. wide rubberized grid pattern and grippable surface. One single 220° turn of the ring moves focus from infinity to closest position. Toward the rear, directly in front of the most welcome, large, locking rotatable tripod mounting ring and platform, is the zoom ring with a ¾-in. wide gripping band marked at 90, 105, 135 150 and 180mm controlling the three zooming elements. At the far rear is the aperture ring with both full and half f/stop detents (except between f/16 and f/22).

On the bright-finish black barrel are magnification scales for the 90, 135 and 180mm focal lengths, so that the user, if he wishes, can select the proper magnification at these three focal lengths—probably of most use to medical and nature photographers who can predetermine what image size ratio they wish.



Well-marked lens barrel shows reproduction ratio for 90, 135, and 180mm focal lengths.

While our resolution figures might not at first appear impressive if you compare them with individual tests of normal single-focal-length, macro-focusing single-focal-length or zoom lenses with no close focusing at all, the combined abilities and quality of image of this Vivitar Series I lens are not even ap-

proached by any other zoom lens. It is by far the best close-focusing zoom going—a zoom lens for which a serious amateur or professional need not make any excuses in terms of results.

Performance

| Our Standard | Tested |
|--|------------|
| Focal length: ± 5% (85.5-94.5)-(171-189)mm | 91.4-183mm |
| Max. aperture: ± 5% (f/4.27-f/4.72) | f/4.48 |
| Distortion: ± 4% at 90mm less than 1% (Barrel) at 135mm 0042 less than 1% (pincushion) at 180mm 1% (pincushion) | |
| Light falloff: at f/5.6 ± 1 stop from theoretical limit 90mm (-0.16 stops) -0.29 stops 135mm (-0.07 stops) -0.83 stops 180mm (-0.04 stops) -1 stop | |

Resolution

at 90mm at 1:48 magnification

| f/no. | Center Lines/mm | Corner Lines/mm |
|-------|-----------------|-----------------|
| 4.5 | Excellent | 48 |
| 5.6 | Good | 43 |
| 8 | Good | 43 |
| 11 | Good | 43 |
| 16 | V/Good | 43 |
| 22 | V/Good | 48 |

at 135mm at 1:48 magnification

| f/no. | Center Lines/mm | Corner Lines/mm |
|-------|-----------------|-----------------|
| 4.5 | Excellent | 48 |
| 5.6 | Excellent | 54 |
| 8 | V/Good | 48 |
| 11 | V/Good | 48 |
| 16 | V/Good | 48 |
| 22 | V/Good | 48 |

at 180mm at 1:51 magnification

| f/no. | Center Lines/mm | Corner Lines/mm |
|-------|-----------------|-----------------|
| 4.5 | Excellent | 51 |
| 5.6 | V/Good | 51 |
| 8 | V/Good | 51 |
| 11 | V/Good | 45 |
| 16 | V/Good | 45 |
| 22 | V/Good | 45 |

Contrast

at 90mm at 30 lines/mm

| f/no. | Center % | Corner % |
|-------|----------|----------|
| 4.5 | Low | 30 |
| 5.6 | Low | 40 |
| 8 | Medium | 58 |
| 11 | Medium | 54 |
| 16 | Medium | 49 |
| 22 | Low | 42 |

at 135mm at 30 lines/mm

| f/no. | Center % | Corner % |
|-------|----------|----------|
| 4.5 | Medium | 40 |
| 5.6 | Medium | 49 |
| 8 | Medium | 54 |
| 11 | Medium | 52 |
| 16 | Medium | 48 |
| 22 | Low | 42 |

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Contrast

| at 180mm at 30 lines/mm | | | | |
|----------------------------|----------|----|----------|----|
| f/no. | Center % | | Corner % | |
| 4.5 | V/Low | 22 | V/Low | 10 |
| 5.6 | V/Low | 30 | V/Low | 10 |
| 8 | Low | 43 | V/Low | 14 |
| 11 | Low | 46 | Low | 24 |
| 16 | Low | 42 | Low | 26 |
| 22 | Low | 38 | Low | 25 |

Resolution

| at 90mm at 1:4 magnification | | | | |
|---------------------------------|--------------------|----|--------------------|----|
| f/no. | Center Lines/mm | | Corner Lines/mm | |
| 4.5 | Good | 35 | V/Good | 31 |
| 5.6 | Accept. | 35 | Excellent | 35 |
| 8 | Accept. | 35 | Good | 35 |
| 11 | Accept. | 35 | V/Good | 35 |
| 16 | Accept. | 35 | V/Good | 35 |
| 22 | Good | 39 | Excellent | 39 |

Resolution

| at 135mm at 1:4 magnification | | | | |
|----------------------------------|--------------------|----|--------------------|----|
| f/no. | Center Lines/mm | | Corner Lines/mm | |
| 4.5 | V/Good | 41 | V/Good | 32 |
| 5.6 | V/Good | 46 | V/Good | 32 |
| 8 | Good | 41 | V/Good | 36 |
| 11 | Good | 41 | V/Good | 36 |
| 16 | Good | 41 | V/Good | 36 |
| 22 | Good | 41 | Good | 32 |

Resolution

| at 180mm at 1:4 magnification | | | | |
|----------------------------------|--------------------|----|--------------------|----|
| f/no. | Center Lines/mm | | Corner Lines/mm | |
| 4.5 | V/Good | 44 | Accept. | 27 |
| 5.6 | Good | 44 | Good | 31 |
| 8 | Good | 44 | Accept. | 31 |
| 11 | Good | 39 | Good | 31 |
| 16 | Good | 39 | Good | 31 |
| 22 | Accept. | 35 | Good | 31 |

On the Optical Bench: At 90mm, the axial star image indicated slight undercorrected spherical aberration yielding a trace of purple flare. At f/6.3, less than two stops down, we could observe a well-centered diffraction pattern. Off axis, we observed astigmatism, but it was very slight, even at f/4.5. Also visible here was a very small amount of lateral color, less than 0.02mm. Zooming to the 135mm focal length position we measured a slight focus shift, about 1mm, but the central image quality seen from the optical bench appeared to be improved. There was still some undercorrected spherical aberration, but less than at 90mm and without coloration. At the edge of the picture taking field, the lens exhibited signs of color variation with coma and still some astigmatism, but less than at the lower focal length. At the telephoto position, we judged the central star image seen on the bench to be very good, with just a bit of red flare visible. Off-axis, there was a slight coma and some color aberration, but almost no astigmatism. Focusing the lens down to the macro position, the central image at all focal lengths exhibited a bit of undercorrected spherical aberration wide open, but no axial color errors were visible.

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At the longer focal lengths, image quality was considered excellent at $f/8$. Off axis, there was no astigmatism visible through to 180mm, but coma and lateral color were observed. The size of the coma was smaller than average, as was the lateral color, but slightly greater than at normal focusing distances. *In field test slides:* Images produced by this lens were on a par with straight macro lenses, and considerably better than zooms with close-up modes. Slides shot with the lens wide open were good center and edge and only got better as the lens was stopped down. Some comatic streaking was noticeable, but mainly wide open. As we expected from our bench notes, close-up work produced sharp crisp images with minimal effect from the lateral color, but the comatic streaking was more apparent than in shots at infinity. Still, stopping down the lens remedied this fault, leaving us with very good image quality. Residual ghosts and flare were visible in shots taken into strong light sources, but still well controlled by multicoating. Overall image quality of this zoom is very good.