The figure shows the setup: the slide holder (or other object holder) is placed far enough from the laser's pinhole filter to have the expanding beam spot cover the specimen, and the 135mm lens L is used to image the object onto a viewing screen (the filter plane is located where the camera lens images the pinhole). An auxiliary camera lens M may be used as a projection lens to provide extra magnification.

1. Observe Fourier transform properties of lens. Look at the Ronchi ruling (linear grating) and lattice grating (piece of window screen) slides. Place a slide in the slide holder and observe the normal image on the screen. Then take a piece of paper or ground glass and follow the image from the 135mm lens to the screen. Note that at some intermediate point F the Fraunhofer diffraction pattern of the grating is observed. This is the plane in which spatial filtering can be performed. Similarly observe the Fourier transform patterns for the pattern of particle tracks (Metrologic slide 22), and the Einstein portrait. Note the surprising regularity of the latter.

2. Remove horizontal structure from images with slit: Place the adjustable slit in the beam at the filter point F. As the filter is closed down, the portions of the Fraunhofer pattern representing horizontal structure are blocked, and the lattice grating image turns into horizontal lines. Rotate the slit (or the object) 90 deg and do the same to the vertical structure. Note how spatial filtering can, for example, be used to remove non-parallel tracks (or emphasize them) from the image of slide 22. Note also how the letters making up the word "METROLOGIC" on the bottom of the slide reduce to only horizontal (or vertical) components as the slit is closed.

3. Remove halftone artifacts from Einstein picture. Use a long path setup with the 180deg mirror set, and put the iris diaphragm at the Fourier Transform plane. When you stop down the iris, the halftone dots in the photo are smoothed away.

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Laser Microscope lens + spatial filter pinhole slide holder Camera lens
F: filter plane (image of pinhole) screen (image of slide)
L
M
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