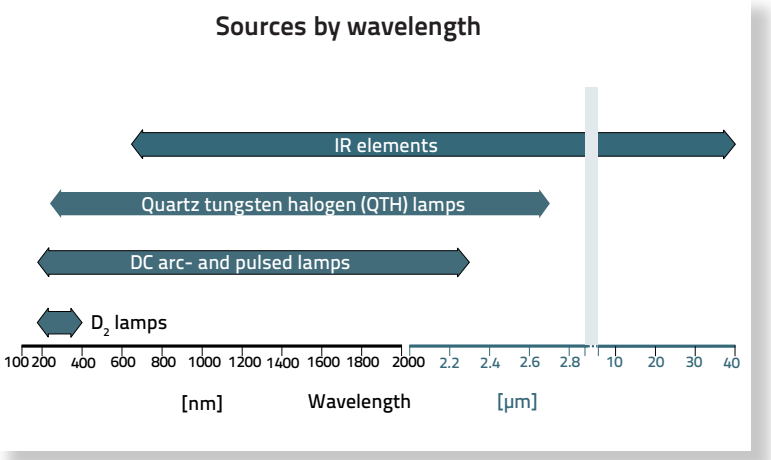
Choosing the right source



Spectral distribution
The figure shows the major advantages of each light source family.

Choose a lamp with high output in your spectral region and low output at wavelengths that may cause stray light or other problems. Arc lamps are primarily UV to VIS light sources. Mercury arc lamps have very strong peaks in the ultraviolet region.

Deuterium lamps: 160 to 400 nm
- Source with the lowest wavelength output
- Negligible VIS-IR output
- Preferred source for UV spectroscopy because it ensures best S/N for UV measurements
- Smooth continuous UV spectrum
- Calibrated versions available

DC arc lamps: 200 to 2500 nm
- Produce highest irradiance on small targets, because of high radiance arc
- Can produce intense collimated beams
- Intense UV output
- Can simulate solar spectrum

Quartz tungsten halogen (QTH) lamps: 250 to 2700 nm
- Excellent stability
- Continuous spectrum
- Ideal for radiometric and photometric applications
- High total visible output
- Easy and inexpensive to operate
- Calibrated versions available
- Good choice for longwave VIS to NIR applications

IR elements: 700 nm to 40 µm
- Small radiating area, therefore good for IR spectroscopy
- Different models available with different emissivity
- Long life

Radiance
You will usually find one or more lenses between the source and the area to be illuminated (monochromator slit, fiber optic, detector, target). With lenses or any other kind of imaging devices you can change the irradiance on the detecting area, but not the radiance. You can't get an image that is brighter than the source.

If you have to pass the radiation through optical components, then radiance is important. Smaller sources are easier to collimate and therefore better to focus. If for example you would like to irradiate a slit, fiber or pinhole, i.e. if the area you are irradiating is of the same size or smaller than the source, then the radiance of the wavelength you need is important.

The irradiance curves divided by the source area give a first order comparison. For example, the radiance produced by a 75 W Xe lamp is 2.7 times higher than the radiance of a 150 W Xe lamp because the arc size is 8.8 times smaller.

Total output
For large areas to be irradiated, in many cases the total power is more important than the radiance.The radiance of a 75 W Xe arc lamp is similar to that of a 1000 W Xe arc lamp, but but if its target area is only a few square centimeters, the 1000 W source produces about 30 times the irradiance of the smaller lamp.

In cases where you are using the raw lamp output, and collimation is not important, the irradiance curves are a good basis on which to choose the lamp.

Source size and shape
Available optics and the size and shape of the source determine how much you can get on target. An elongated source can be a better match to a slit target. With non imaging reflectors such as elliptical reflectors, the size, shape, and angle of the secondary image are more important than the primary arc or filament.

Source stability
Spatial and temporal stability of source radiation is so important for some measurements that a double beam design is standard. In general, tungsten halogen lamps are more stable than high-radiance arc lamps.

Optical feedback can improve long-term source stability but it is also important to use good design practice. For example, the convection currents inside an arc lamp lead to a lot of fluctuations on the low-radiance outer regions of the arc. A well-designed system will not use these unstable zones.

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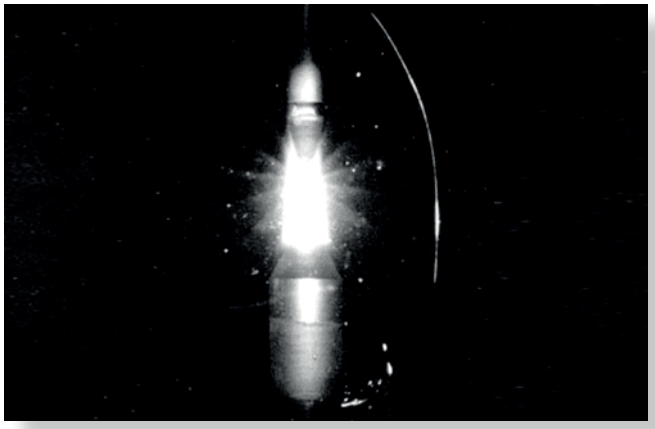
Choosing the right source

Arc or halogen lamp?

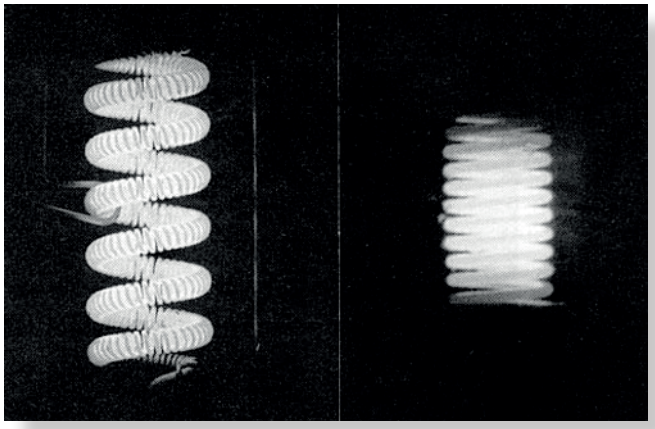
Arc lamps



Features
- High radiance in the ultraviolet and visible
- Mercury lamps have spectral lines of very high irradiance in the ultraviolet
- High ultraviolet output
- Small concentrated arc
- Xe lamps have spectral distribution resembling the sun

Benefits
- Produce highest irradiance on small targets
- Intense collimated beams due to small, high radiance source
- Excellent sources for UV photochemistry
- Can simulate daylight

Halogen lamps



Features
- High total visible output
- Excellent stability
- Excellent photometric or radiometric sources
- (250 – 2500 nm)
- Slow variation of output with wavelength

Benefits
- Easy-to-use
- Simplify detection in spectral scanning
- Less expensive than arc lamps

The best is to call us!

We will talk about your application and help you make your final selection of the best source and necessary accessories.

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