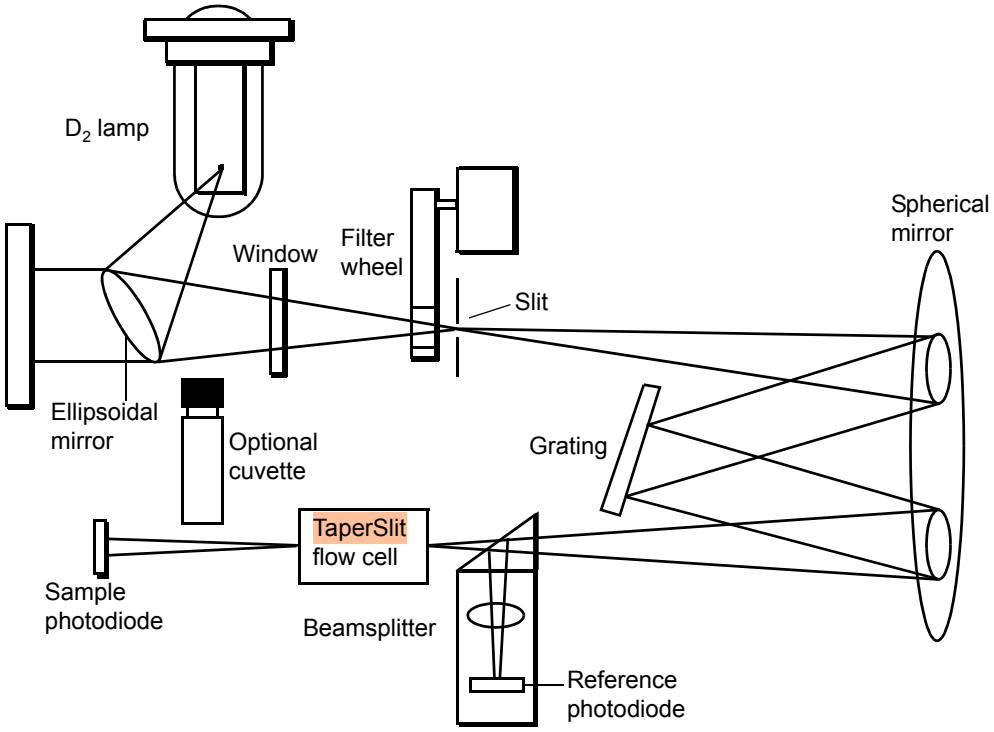
Waters 2489 UV/Visible detector optics assembly



Optics assembly light path

The detector provides an extremely efficient design for exceptionally high light throughput. It operates as follows:

1. The ellipsoidal mirror collects light from the lamp and focuses it through the filter wheel onto the entrance slit. The spherical mirror directs light toward the grating. A different portion of the spherical mirror focuses dispersed light of a particular wavelength band, determined by the grating angle, onto the entrance of the flow cell. Light exiting the flow cell passes through the cuvette location to the sample photodiode.
2. The beamsplitter, located just ahead of the flow cell, diverts a portion of the light to a reference photodiode.
3. When you enter a new wavelength through the detector's front panel (or through Empower or MassLynx software), the detector rotates the grating to the appropriate position.

4. The preamplifier board integrates and digitizes the currents from the photodiodes for processing by the signal processing electronics and output to a computer, chart recorder, or integrator.

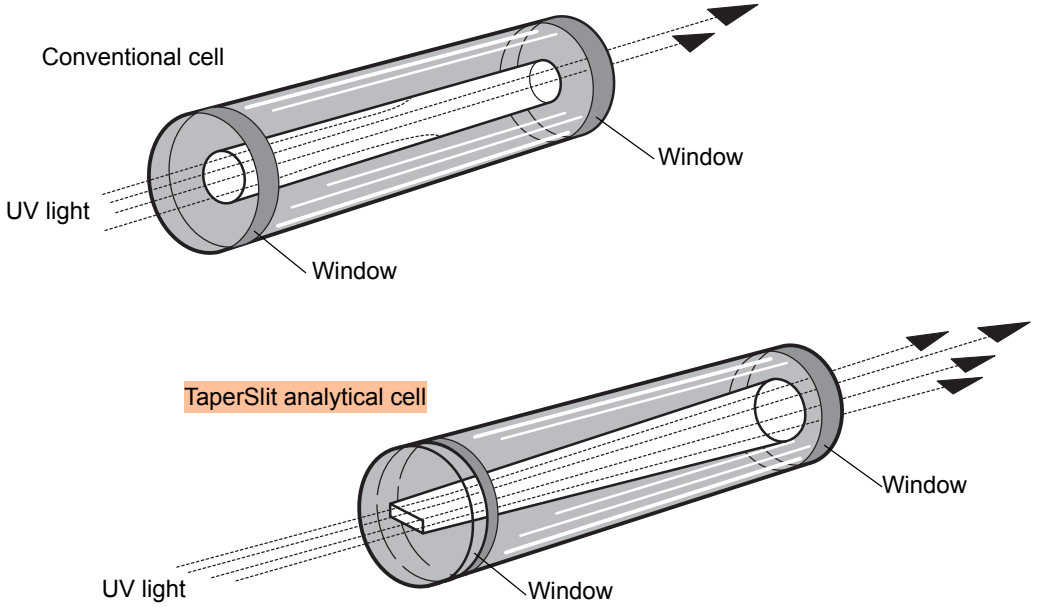
Waters TaperSlit Flow Cell

The Waters TaperSlit Flow Cell used in this detector renders the detector baseline less sensitive to changes in mobile phase refractive index (RI). RI changes occur during gradient separations or result from temperature or pump-induced pressure fluctuations.

To achieve RI immunity, a combination of a spherical mirror, a lens at the entrance of the flow cell, and a taper to the internal bore of the flow cell prevents light rays from striking the internal walls of the flow cell. An additional feature of the TaperSlit flow cell and the reason for its name is the shape of the flow cell entrance, which matches the shape of the entrance slit. The detector achieves higher light throughput for a given spectral resolution via the TaperSlit cell design, compared to a conventional flow cell with a circular entrance.

As shown in the figure below, in a conventional cell, light bends and hits the wall of the flow cell. Four beams go in, but only two come out. In the Waters TaperSlit analytical cell, the combination of the lens and TaperSlit bore geometry prevents light from hitting the cell walls. Four beams go in, and four beams come out.

Comparison of flow cell characteristics



The standard analytical, inert, and LC/MS cells have a path length of 10 mm. The semi-prep and microbore cell path length is 3 mm. The autopurification cell path length is 1.0 mm. A variable path length flow cell (path length 0.15 to 3 mm) is also available.

Filtering noise

The detector provides a Hamming filter to minimize noise. The Hamming filter is a digital finite impulse response filter, which creates peak height degradation and enhances the filtering of high frequency noise.

The behavior of the filter depends on the filter time-constant you select. You can program a filter time to be Fast, Slow, Normal, or Other. If you select Fast, Slow, or Normal, you do not need to enter a value. The filter constant is determined by the data rate. If you select Other, you can enter a value. However, the value you enter is rounded up or down to a value based on the data rate.

The filter time-constant adjusts the filter response time to achieve an optimal signal-to-noise ratio. Selecting Other and entering a value of 0.0 disables all filtering.