

HET High Resolution Spectrograph Advisory

HRS collimator folding flat replacement

Phillip MacQueen - 11 October 2007

Issue

An inspection of the HRS post-slit folding mirror indicated that the mirror coating had failed. The coating had a gold hue, indicating that the blue reflectivity was low. The coating also appeared to have high scatter under laser illumination.

Issue resolution

A new mirror has been purchased, installed and commissioned as of October 3, 2007. The performance of both the old and new mirrors has been characterized. A significant improvement in HRS throughput has resulted, especially at short wavelengths.

Performance changes

Figure 1 shows the reflectivity of the old and new mirrors as a function of wavelength. The blue limit of the curves is the HRS blue limit at 375 nm, and the red limit is the limit of our measuring equipment. Figure 2 shows the resulting gain in HRS throughput as a function of wavelength. The curve is the ratio of reflectivities of the new and old mirrors.

Users should note that there has been a small change in the position of the spectrum on the CCDs. The shift is under 2 pixels, and is the residual from re-aligning the new mirror in the spectrograph.

Background

The original mirror coating was SiO₂-overcoated silver. Such coatings typically have a reflectivity of 97-98% on the red side of 430 nm, dropping to around 90% between 350-400 nm. The performance degrades slightly when the angle of incidence is high, such as on the folding flat in the HRS.

The new mirror has a MaxMirror™ coating. It has around 99% reflectivity from 320 -1100 nm, and maintains its high performance when used at angles of incidence up to 50°. It is also designed to have extremely low scatter for laser use, which is a benefit for reducing scattered light in a spectrograph.

Gordon Wesley designed an adaptation of the mirror holder to minimize the thermal stress in the mirror glass when it is mounted.

HRS folding flat reflectivity at 45-degree AOI

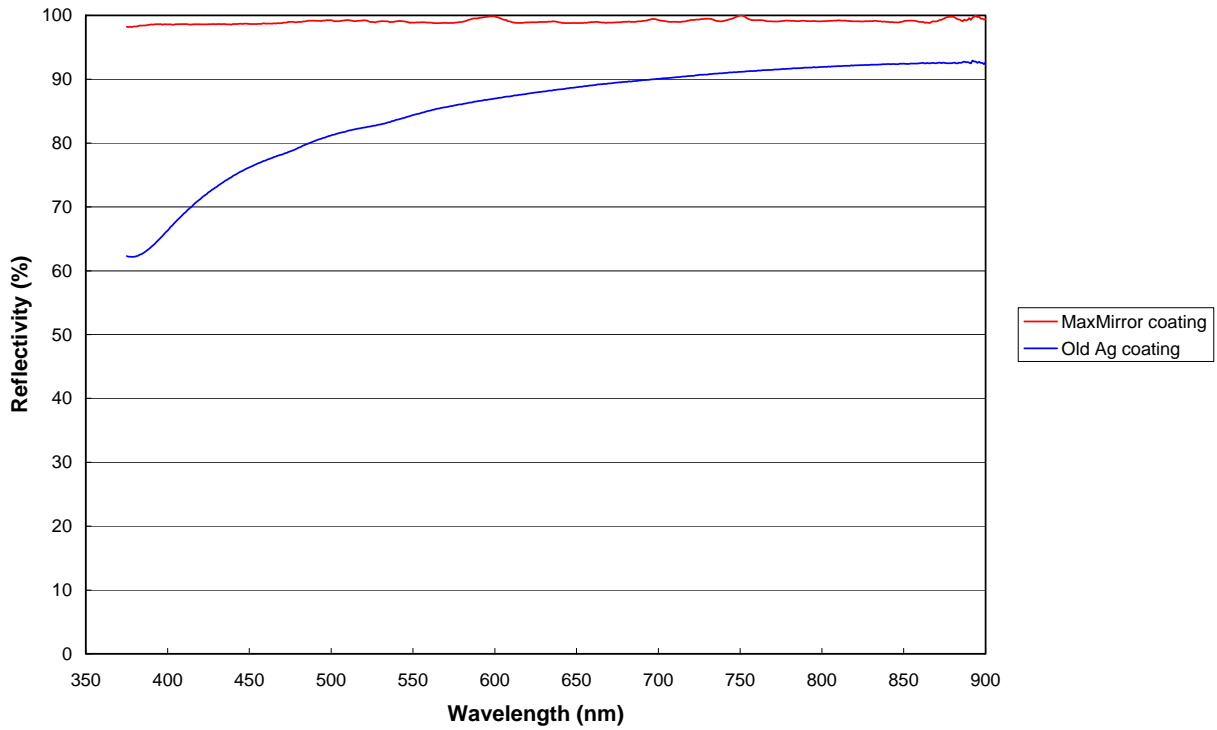


Figure 1: reflectivities of the old and new HRS collimator folding flat mirrors.

Gain in HRS folding flat reflectivity

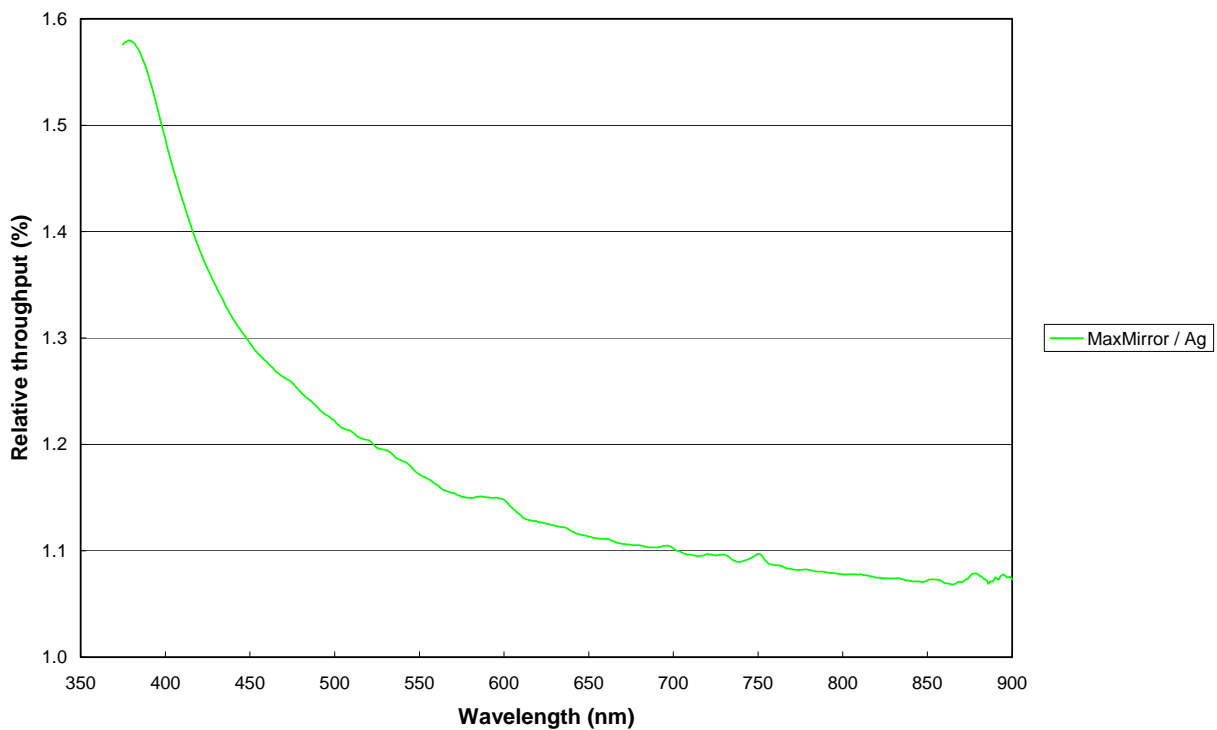


Figure 2: Gain in HRS throughput from replacing the collimator folding flat mirror.