

## 2.6 The overall efficiency of the spectrograph

We next show the transmission of collimator + camera that we obtain from ZEMAX, using SolGel + MgF2 on lens surfaces; the coating is optimized at primary wavelength 550 nm.

-----  
Polarization Transmission Data

Date : TUE APR 3 2001

Field is unpolarized.

Grid Size : 32 x 32

Aperture, Fresnel, coating, vignetting, and internal transmittance effects are considered.

Field Pos : 0.0000, 0.0000 mm

Transmission at	0.3500:	0.691763540
Transmission at	0.3700:	0.760224556
Transmission at	0.3900:	0.798603030
Transmission at	0.4000:	0.808504481
Transmission at	0.4500:	0.817273277
Transmission at	0.5000:	0.807358972
Transmission at	0.5500:	0.803854101
Transmission at	0.6000:	0.808283922
Transmission at	0.6500:	0.815482640
Transmission at	0.7000:	0.822185398
Transmission at	0.8000:	0.823716714
Transmission at	0.9000:	0.810965047
Total Transmission	:	0.797351307

Chief Ray Transmission Surface By Surface: we present it here only for 350 nm wavelength, the worst transmission in the table above; the worst surface, number 4, is the mirror

Field Pos : 0.0000, 0.0000 mm

Wavelength 1: 0.350 microns

Surf	Tot. Tran	Rel. Tran
1	1.000000	1.000000
2	0.987096	0.987096
3	0.987096	1.000000
4	0.933832	0.946040
5	0.922898	0.988291
6	0.912403	0.988628
7	0.902973	0.989665
8	0.869409	0.962829
9	0.837180	0.962930
10	0.826425	0.987154
11	0.826425	1.000000
12	0.826425	1.000000
13	0.826425	1.000000
14	0.826425	1.000000
15	0.826425	1.000000
16	0.815004	0.986180
17	0.813731	0.998438

18	0.803481	0.987403
19	0.803150	0.999589
20	0.789852	0.983443
21	0.780230	0.987817
22	0.761485	0.975976
23	0.750964	0.986184
24	0.740595	0.986192
25	0.732121	0.988558
26	0.722968	0.987498
27	0.722890	0.999892
28	0.722819	0.999902
29	0.709872	0.982088
30	0.700736	0.987130
31	0.691699	0.987104
32	0.691699	1.000000

We next present the predictions, at present time, for total efficiency at 350 nm. Note that fiber transmission can be seen in figure 2.4, and is slightly increased because of smaller fiber length.

---

Atmosphere	85%
Telescope +pick-off mirr	80%
Fore-optics	90 %
Fiber transmission	87%
Loss due to F.R. degrad	70%
Spectrograph transmission	70%
Grating efficiency	70%
CCD	70%
TOTAL	13%

---

We reach 13% overall efficiency at 350 nm. This number is strongly dependent on the CCD efficiency, we are not sure, at present time, what CCD are we going to have. We can see that the loss due to focal ratio degradation is a major factor; we are presently studying ways of producing less stress in the fiber slit, and better efficiency. The fiber transmission curve is shown in section 2.4; the CCD efficiency curve is shown below.

The efficiency rises steeply for longer wavelengths.

