

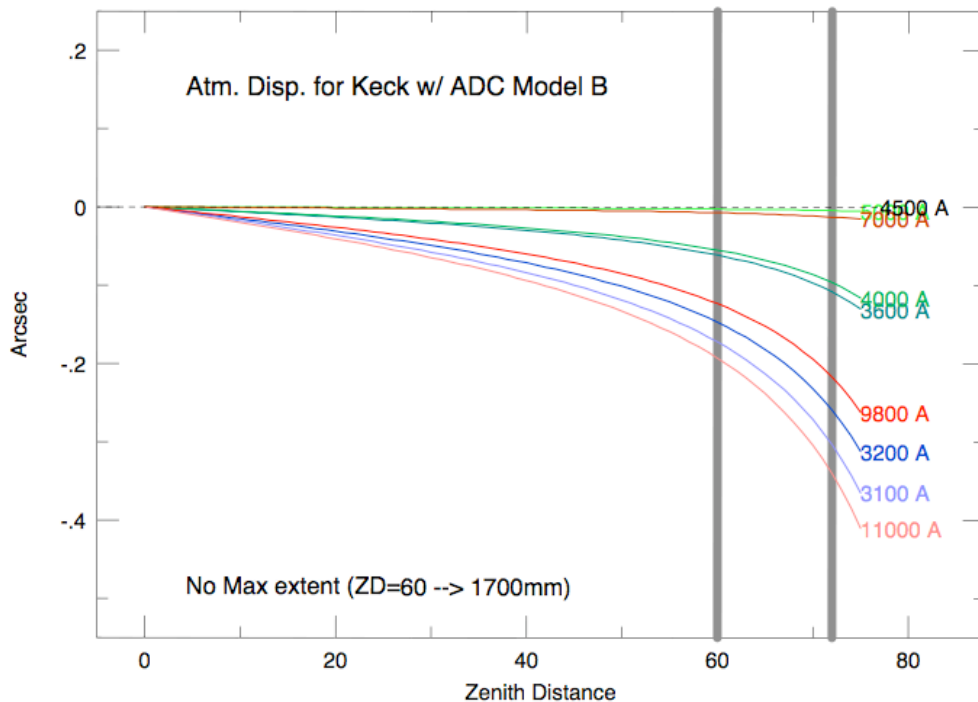
Full-aperture ADC Performance

Introduction:

The previous report covered performance for the “sub-aperture” ADC. Since the CoDR, it was decided that a second design, covering the full aperture of the Keck-I field, should be considered. In order to retain the same thickness of fused silica, it was decided that this second design would have twice the travel (around 1400 mm) and half the prism angle in the two optics (2.5°). While we anticipate virtually identical performance as the previous design, we present the performance figures derived for this specific design. These demonstrate our expectations were correct – there is virtually no difference between the 700mm/ 5° and 1400mm/ 2.5° designs.

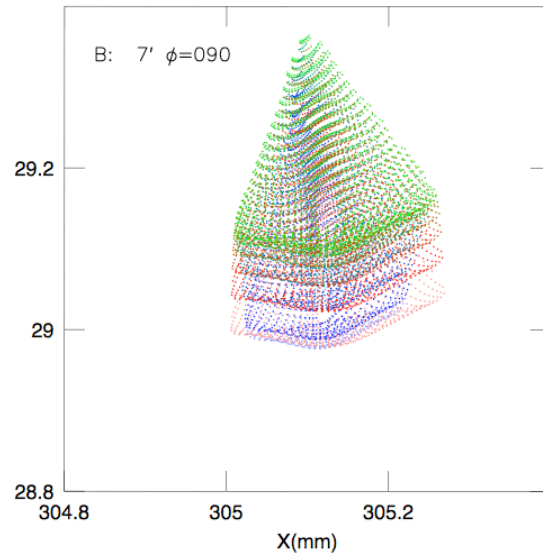
Performance Figures

The following figure shows the full-aperture ADC performance over zenith distances of 0–75 degrees, without maximum prism-separation constraints. At $Z=60$, the full correction requires a separation of 1700mm. As before, the curves are normalized to 4500A.



This figure looks similar but not exactly the same as for the sub-aperture model. The difference is almost certainly due to some inaccuracy or round-off in calculating the “best” prism separation. Relative to the previous case, the IR is correctly slightly better at the expense of the UV correction.

The figure to the right is a typical spot diagram showing ADC-corrected images at all the sample wavelengths. This is at $Z=55^\circ$ and 1400mm separation.



Residual dispersion values:

$\lambda(\mu m)$	Residual (Z=55)	Residual (Z=60)	Residual (Z=60,1400mm)
0.31	-0.090"	-0.109"	(Not calculated)
0.32	-0.069	-0.084	...
0.36	0.001	0.002	...
0.40	0.007	0.008	...
0.45	0.052	0.063	...
0.50	0.050	0.061	...
0.56	0.059	0.071	...
0.63	0.066	0.080	...
0.70	0.046	0.056	...
0.79	0.035	0.043	...
0.88	-0.003	-0.004	...
0.98	-0.050	-0.060	...
1.10	-0.107	-0.130	...
rms	0.060"	0.073"	...

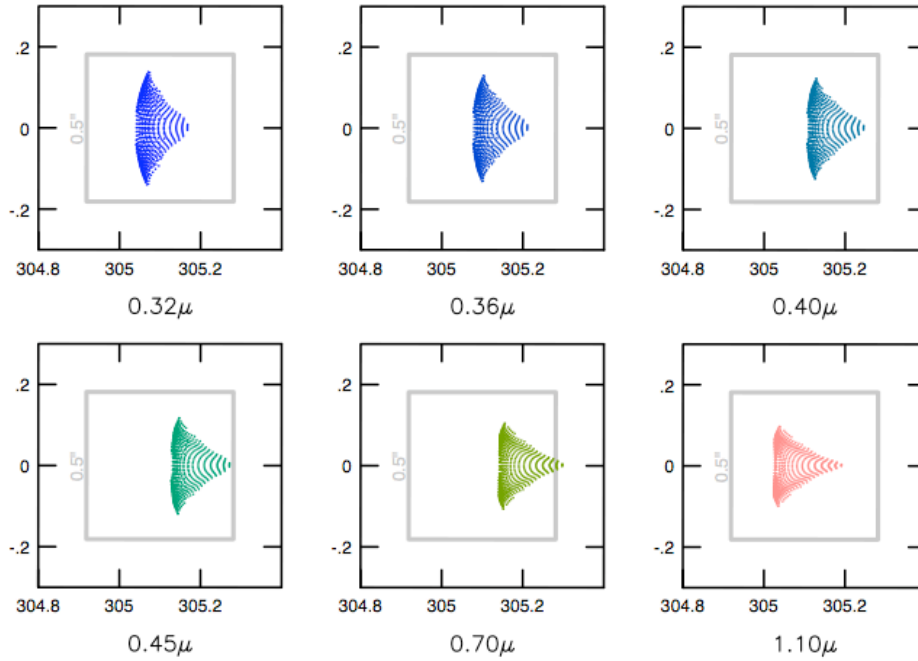
As noted above, the IR correction is slightly better at the expense of the UV correction. This is entirely consistent with a slight difference in calculating the best value for the prism separation, rather than being fundamental to the design.

PSF Quality

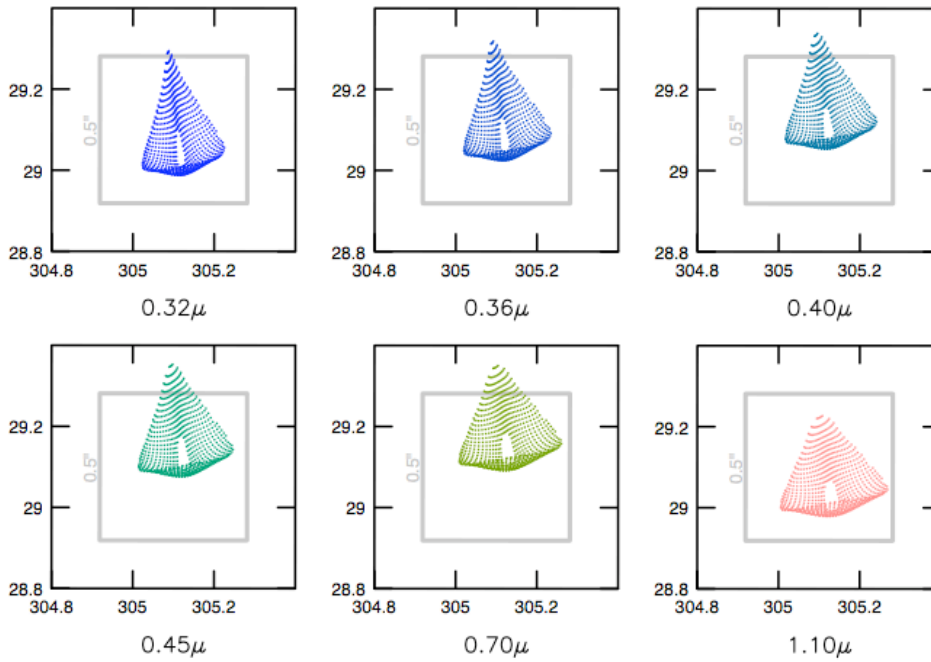
The following spot diagrams are for the full-aperture design. They are improved in some cases and worse in others, but the **average** rms-diameter is virtually unchanged at

183 μ m. (The average is calculated from spots at 4, 7 and 10 arcminutes off-axis, with the prisms oriented at 0, 90 and 180 degrees. The previous rms-diameter was 184 μ m.)

angle=7' $\phi=000$, prism sep=1400mm, ZD=55



angle=7' $\phi=090$, prism sep=1400mm, ZD=55



angle=7' $\phi=180$, prism sep=1400mm, ZD=55

