Memo to: 65-m design group
from: S. von Hoerner

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Performance under Extreme Thermal Conditions

With all available latest data, I have calculated the shortest wavelength λ_o through day and night. By good luck, we got at GB almost 3 days with extreme conditions: completely clear sky, dry air, and no wind ($\leq$ 5 mph); with 38 °F day - night variation (for comparison: 28 °F yearly average at Tucson); and with steep changes up to 9.8 °F/hour (4 °F/h at Tucson, 3 random days in July). These GB data are used for Fig.1.

Thermal data used, extremes:

Air: maximum change, $T(14{:}30) - T(6{:}30) = 38$ °F
slope, $-9.8 \leq dT/dt \leq +7.2$ °F/h
Surf. plates: skin - ribs, $-6.3 \leq \Delta T_p \leq +7.7$ °F
(Air and Surf. plates: measured)
Tel.structure: high - low pipes, $-2.9 \leq \Delta T_t \leq +5.9$ °F (estim. + 140-ft data)

Thermal deformations:

Plates: as measured optically
Telescope: computer (1) time-lag heavy pipes, dT/dt
(2) z-gradient, ΔT_t

Gravitational deformations:

Plates	.0016 inch;	measured
Panels	.0027 "	computer, including (1) standard pipes, (2) manufact. tolerances, (3) joints.
Telesc.	.0035 "	computer, including (1) standard pipes, (2) manufact. tolerances, (3) joints.

Else:

Plate accuracy	.0025 inch;	measured
Adjustments	.0035 " ;	Zeiss method

Further Notes:

1. For final performance calculation still needed: better data for ΔT_t; exact values for stiffness and weight of joints; re-cycling between panels and telescope.

2. Wind calculations not yet finished. Wind up to about 10 mph improves performance by decreasing temperature differences and time-lag. Limit for shortest λ probably 15 - 18 mph, meaning 2/3 - 3/4 of all time.

3. Pointing calculations not yet finished (2 - 3 weeks).

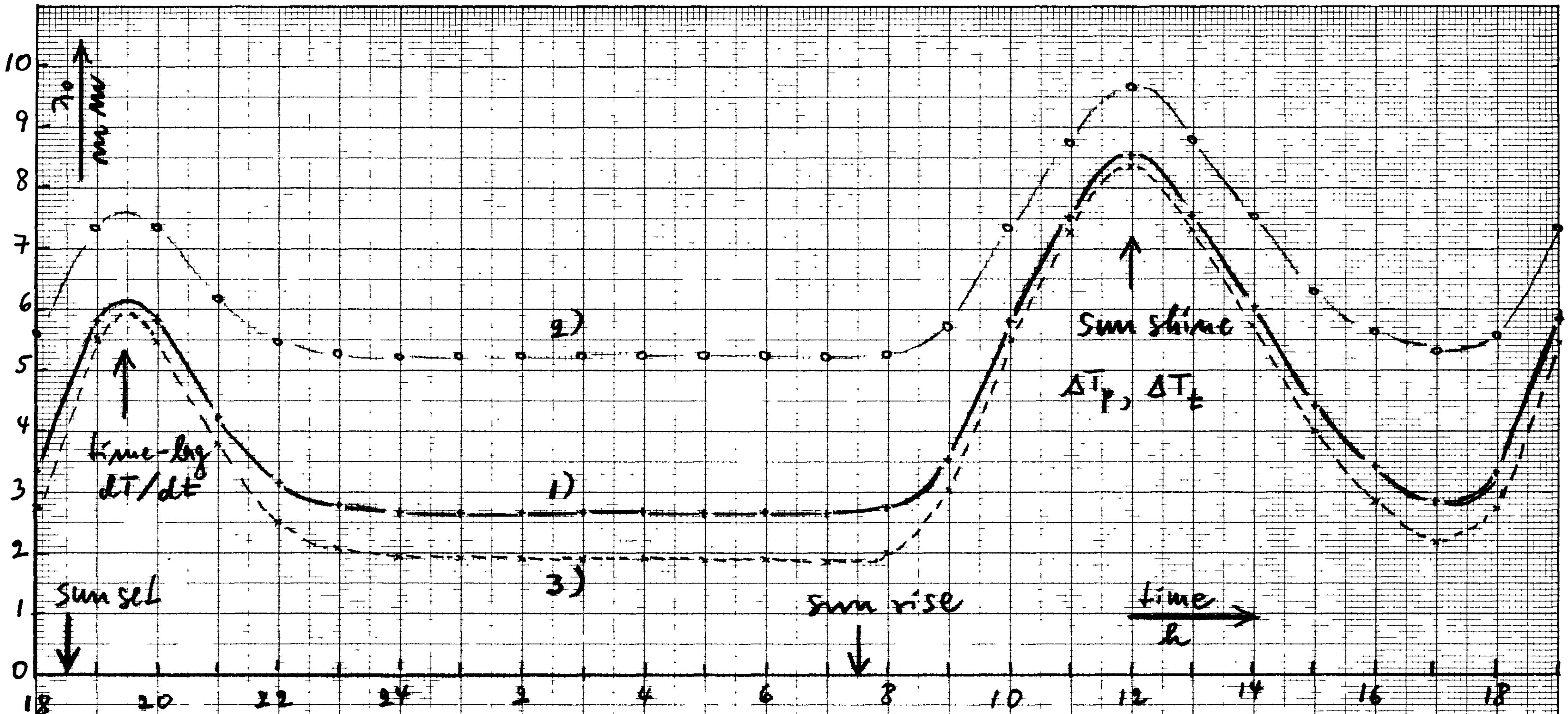

Fig. 1. Performance of 65-m telescope through day and night.
Extreme thermal conditions: clear sky, dry air, no wind.

1) From 0 to 60° zenith angle; } assuming .0035 inch adjustment error
2) At 90° (horizon);
3) From 20° to 50° zenith angle; assuming .0015 inch adjustment error