NGST Systems Engineering Report

Thermal Subsystem 08

Title: **Revisit of High versus Low Emittance Coating on Shield Layer Facing OTA**	
Date: 5/4/98	Number: THSER08
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References: 1. K. Parrish/GSFC, THSER01, "System Level Thermal Analysis Results from Fall 1997 Quarterly," 5-4-98	

Description

A decision was made after the Fall 97Quarterly to baseline a low emittance vapor deposited aluminum (VDA) coating on the cold side layer of the sunshield facing the optical telescope assembly (OTA). VDA has an approximate emittance of 0.03. The use of VDA on the OTA facing layer resulted in colder OTA temperatures. That study was also performed with a four layer sunshield system. Now that the shield has been baselined with six layers, an analysis was performed to see if the low emittance coating was still effective. It was speculated that as the number of layers increase, the emittance on the OTA facing layer becomes less and less significant. A low emittance coating on the cold OTA side also causes numerous reflections of heat energy which causes additional complexity to the thermal analysis of the OTA.

Results Summary

Table 1 lists NGST's major component temperatures with the baselined VDA coating and with a higher emittance black Kapton coating (ε=.7). Even with six layers the OTA still runs slightly colder with the VDA surface, although the effect is less dramatic than with the four layer shield. Based on these results it is recommended to continue to baseline a low emittance coating on the sun shield layer facing the OTA. Although the temperature of the OTA is slightly lower with the VDA the temperature gradient within shield layer six is greater. With a high emittance layer the gradient is less than 36 K and approximately 66 K with the high emittance black shield layer. The trade off of layer gradient versus a slight gain in colder OTA temperatures will have to be reassessed as the shield design becomes better defined and techniques are developed to analyze the shield's thermal deformations.

Table 1

Component	Baseline Temperature K, VDA on Layer 6 facing OTA	Temperature K, Black Kapton on Layer 6 facing OTA
Primary Mirror Max	53	56
Primary Mirror Min	31	33
Primary Mirror Avg.	***42***	***44***
Layer 6 Avg	***123***	***60***
Layer 6 Max	151	77
Layer 6 Min	85	42