36-01520.024

ACIS Verification Summary Report

Specification:	AXAF Observatory to Science Instrument ICD (IF1-20)
Requirement Number/Title:	3.3.1.1.1.2.6 ACIS Support Structure/DPA/DEA Thermal Interfaces (VRSD 3.3.1.1.1.2.6)

Requirement Statement: The Support Structure shall have an external emittance of $\geq$ 0.8 on all sides.

Verification Method:	I.R. Reflectance Measurement and NASA publication.
~~Procedure~~ Reference Number:	NASA Reference Publication 1121, April 1984

Configuration: A sample aluminum panel painted with black Aeroglaze Z306 (formerly Chemglaze Z306) paint was subjected to an IR reflectance measurement on 9/10/96 by Matthew Smith of MIT CSR at the Lincoln Labs.

Cycle Time: N.A.

Verification Discussion/Results:

All external sides of the Support Structure are painted with Aeroglaze Z306 paint. The I.R. reflectance of a sample panel was measured as 0.09. (Reflectance + emittance = 1.0) This value yields a normal emittance of 0.91. NASA conversion tables for normal vs. hemispherical emittance convert this to $0.86 = \text{Emittance}_H$ (Hemispherical emittance), in excess of the minimum requirement of 0.8.

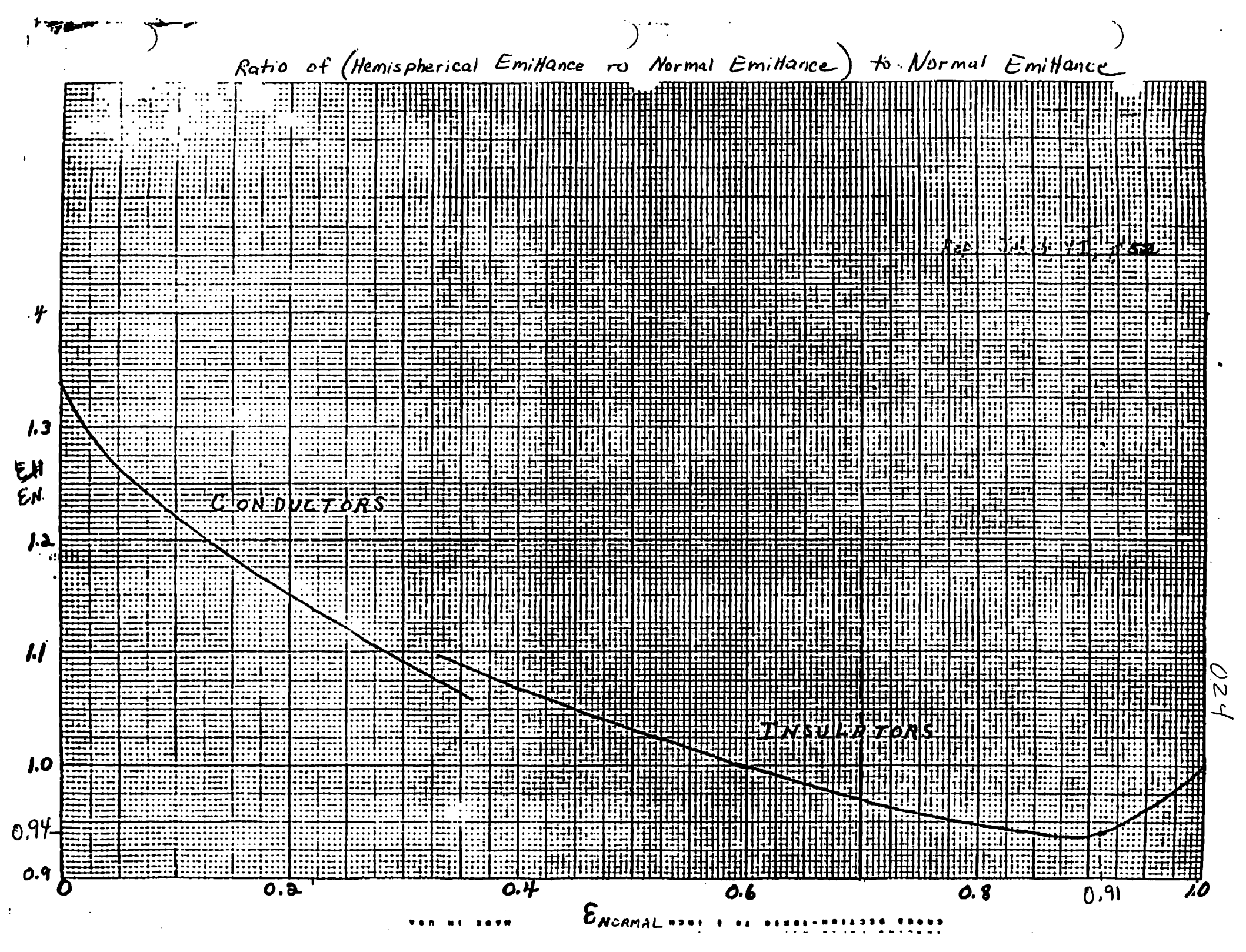
For $E_N = 0.91$, $\frac{\text{Emittance}_H}{\text{Emittance}_N} = 0.94$

$(0.94)(0.91) = 0.86 = \text{Emittance}_H$

NASA Pub. 1121 lists the emittance of Chemglaze Z306 as $0.91 = E_{Normal}$, identical to the MIT measurement results.

Ellen M Sen 5/13/97

ACIS Cognizant Engineer Date


Ratio of (Hemispherical Emittance to Normal Emittance) to Normal Emittance
4
1.3
$\frac{E_H}{E_N}$
1.2
1.1
1.0
0.94
0.9
CONDUCTORS
INSULATORS
0
0.2
0.4
0.6
0.8
0.91
1.0
ε_{NORMAL}
024

BLACK COATINGS

	$\bar{\alpha}_s$	$\bar{\epsilon}_n$
Anodize Black	0.88	0.88
Carbon Black Paint NS-7	0.96	0.88
Catalac Black Paint	0.96	0.88
Chemglaze Black Paint Z306	0.96	0.91
Delrin Black Plastic	0.96	0.87
Ebanol C Black	0.97	0.73
Ebanol C Black–384 ESH* UV	0.97	0.75
GSFC Black Silicate MS-94	0.96	0.89
GSFC Black Paint 313-1	0.96	0.86
Hughson Black Paint H322	0.96	0.86
Hughson Black Paint L-300	0.95	0.84
Martin Black Paint N-150-1	0.94	0.94
Martin Black Velvet Paint	0.91	0.94
3M Black Velvet Paint	0.97	0.91
Paladin Black Lacquer	0.95	0.75
Parsons Black Paint	0.98	0.91
Polyethylene Black Plastic	0.93	0.92
Pyramil Black on Beryllium Copper	0.92	0.72
Tedlar Black Plastic	0.94	0.90
Velestat Black Plastic	0.96	0.85

$\epsilon_h = .855$

*ESH = equivalent Sun hours of ultraviolet radiation.

Reference: NASA Reference Publication 1121, April 1984, "Solar Absorptance and Thermal Emittance of Some Common Spacecraft Thermal-Control Coatings," by John H. Henninger.