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TEST PROCEDURE FOR HASSELBLAD FIELD IRRADIANCE

Prepared By

Lockheed Electronics Company, Inc.

Aerospace Systems Division

Houston, Texas

Contract NAS-9-12200

For

CAMERA AND OPTICAL ENGINEERING DEPARTMENT

National Aeronautics and Space Administration

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(See instructions on reverse side.)

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13. ABSTRACT

THIS DOCUMENT DEFINES THE PROCEDURE FOR DETERMINING THE UNIFORMITY OF FILM PLANE ILLUMINATION (FIELD IRRADIANCE) OF HASSELBLAD CAMERAS.

14. SUBJECT TERMS

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PROJECT DOCUMENT COVER SHEET

TEST PROCEDURE

FOR

HASSELBLAD

FIELD IRRADIANCE

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PREPARED BY:	C. George — Approved: P. M. Griffiths
APPROVED:	(BRANCH AND/OR SUPPORT OFFICE) ED/8 E. Pearce
APPROVED:	(DIVISION) ED/8 H. Kuehnel
APPROVED:	(PROGRAM OFFICE) ND/5 D. Dittmar 4/15/75

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1.0 PURPOSE

The purpose of this document is to define the procedure for determining the uniformity of film plane illumination (field irradiance) of the Hasselblad cameras.

The data source shall consist of photographs, with X-Y scans being taken for indication only. The accuracy requirement is 2.0%.

2.0 APPLICATION

This document is applicable to all Hasselblad lens field irradiance tests unless otherwise specified. All data and comments are to be recorded on the Data Sheet, Part II (see Table 4-1). All testing shall be verified by Government inspection.

3.0 TEST EQUIPMENT

The following equipment is utilized in the determination of field irradiance. (See Figure 3-1 for an illustration of the test setup.)

- Photometer, Gamma Model 2020, S/N 793
- Photomultiplier, Gamma Model 2020-1, S/N 784
- Automatic Photometer Scan, NASA No. 86684
- Hasselblad Mounting Fixture
- Beck Hemisphere, S/N 002
- IL700 Research Radiometer, S/N 84
- Variac
- IL700 Detector, PT171C, S/N 86
- Power Source, NASA No. 36129 (DC Power Supply)
- Shutter Release Box
- Fiber Optic Probe with Cosine Adapter (.016" Salisbury cap attached)

4.0 TEST PROCEDURE

4.1 Equipment Setup

4.1.1 Record test equipment and test article part number (P/N) and/or serial number (S/N) on the Data Sheet, Part II.

4.1.2 Verify that test equipment is operational.

4.2 Calibration Procedure

4.2.1 Mount the camera and lens on the Hasselblad mounting fixture.

TO BE PROVIDED

FIGURE 3-1 FIELD IRRADIANCE TEST SETUP

4.2.2 Verify that the mounting fixture is in correct orientation (i.e., the bottom thumbscrews shall be all the way up so that the camera is vertical).

4.2.3 Set Variac to required voltage. Verify with the IL700 photometer. Record data on the Data Sheet.

4.2.4 Open the camera shutter.

4.2.5 Put the X-Y scanner into manual control and check the X-Y scan plane manually.

NOTE: THE MAIN DATA SOURCE CONSISTS OF PHOTOGRAPHS. THE X-Y SCAN IS FOR INDICATION ONLY.

4.2.6 With the X-Y scanner in manual control, define the following:

- X-start position
- Increment size of X
- Number of increments in X
- Y-start position
- Increment size of Y
- Number of increments in Y

Record information on Data Sheet, Part I.

4.2.7 Check for photometer and set it to a range of 100 $\pm$ 5 by varying the HV adjust.

4.2.8 Set f/number to the largest aperture. Record on Data Sheet, Part I.

4.2.9 Run X-Y scan as per the parameters derived in Paragraph 4.2.6.

4.2.10 Repeat Step 4.2.6 for the center veritcal scan of film plane.

4.2.11 Remove fiber probe assembly and install magazine containing type 3400 film.

4.2.12 Turn off scanner and close camera shutter.

4.2.13 Set the camera to the largest f/number (smallest numerical setting). Record on Data Sheet, Part I.

4.2.14 Set exposure time to matrix value for largest f/number (smallest numerical setting). Record on Data Sheet, Part I.

4.2.15 Open the camera shutter.

4.2.16 Take three data frames and blank two.

4.2.17 Set the lens to the next f/number until all f/numbers below f/16 have been completed. Record on Data Sheet, Part I. When all f/numbers below f/16 have been completed, go to Paragraph 4.2.19.

4.2.18 Repeat Paragraphs 4.2.14 through 4.2.17.

4.2.19 Place the second lens on the camera and repeat Paragraphs 4.2.13 and all following steps. With the second lens on the camera, repeat Paragraphs 4.2.2 through 4.2.10.

4.2.20 Turn off all test equipment.

4.2.21 Remove Hasselblad camera from calibration setup.

TABLE 4-1
DATA SHEET FOR
FIELD IRRADIANCE
PART I - CHECKOUT

PARA REF	DESCRIPTION	INSPECTION
4.1.1	P/N's and/or S/N's of the test equipment recorded on Part II of the Data Sheet	
4.1.2	Equipment is operational.	
4.2.1	Camera and lens are mounted on the Hasselblad mounting fixture.	
4.2.2	The Hasselblad mounting fixture is in correct orientation (i.e., the camera is vertical).	
4.2.3	The Variac is set to the following voltage and verified with the IL700 photometer •	
4.2.4	The camera shutter is open.	
4.2.5	The X-Y scanner is in manual control.	
	The X-Y scan plane is checked manually.	
4.2.6	The X-Y scanner is in manual control.	
	The following are defined: • X-start position: • Increment size of X: • Number of increments in X: • Y-start position: • Increment size of Y: • Number of increments in Y:	
4.2.7	The photometer is checked and set to a range of 100 ±5 by varying the HV adjust.	

TABLE 4-1 (CONT'D)

PART I - CHECKOUT

PARA REF	DESCRIPTION	INSPECTION
4.2.8	The f/number is set to the largest aperture as follows: •	
4.2.9	The X-Y scan is run using the parameters defined in Paragraph 4.2.6 of the Data Sheet, Part I.	
4.2.10	Repeat Step 4.2.6 for the center verical scan of film plane.	
4.2.11	The fiber probe assembly is removed.	
	Magazine containing type 3400 file is installed.	
4.2.12	Scanner is turned off.	
	Camera shutter is closed.	
4.2.13	The f/number is set to the largest f/number (smallest numerical setting) as follows: •	
4.2.14	Exposure time is set to matrix value for largest f/number (smallest numerical setting) as follows: •	
4.2.15	The camera shutter is open.	
4.2.16	Three data frames are taken.	
	Two data frames are blanked.	

TABLE 4-1 -(CONT'D)

PART I - CHECKOUT

PARA REF	DESCRIPTION	INSPECTION
4.2.17	The lens is set to the next f/number until all f/numbers below f/16 are completed. The f/numbers used are as follows: • • • • Upon completing all f/numbers below f/16, the steps in Paragraph 4.2.19 are performed.	
4.2.18	Steps in Paragraph 4.2.14 through 4.2.17 are performed as follows: A. Paragraph 4.2.14. Exposure time is set to matrix value for largest (smallest numerical setting) f/number as follows: •	
	B. Paragraph 4.2.15. The camera shutter is open.	
	C. Paragraph 4.2.16. Three data frames are taken. Two data frames are blanked.	
	D. Paragraph 4.2.17. The lens is set to the next f/number until all f/numbers below f/16 are completed. The f/numbers used are as follows: • • • •	

TABLE 4-1 - (CONT'D)

PART I CHECKOUT

PARA REF	DESCRIPTION	INSPECTION
4.2.19	The second lens is placed on the camera and steps described in Paragraphs 4.2.13 through 4.2.17 are performed.	
	A. Paragraph 4.2.13. The f/number is set to the largest f/number (smallest numerical setting) as follows: •	
	B. Paragraph 4.2.14. Exposure time is set to matrix value for largest f/number (smallest numerical setting) as follows: •	
	C. Paragraph 4.2.15. The camera shutter is open.	
	D. Paragraph 4.2.16. Three data frames are taken. Two data frames are blanked.	
	E. Paragraph 4.2.17. The lens is set to the next f/number until all f/numbers below f/16 have been used. The f/numbers used are as follows: • • • • If the second lens is already on the camera, the steps described in Paragraphs 4.2.2 through 4.2.10 are performed as follows:	

TABLE 4-1 (CONT'D)

PART I - CHECKOUT

PARA REF	DESCRIPTION	INSPECTION
4.2.19 (Cont'd)	1. Paragraph 4.2.2. The Hasselblad mounting fixture is in correct orientation (i.e., the camera is vertical).	
	2. Paragraph 4.2.3. The Variac is set to the following voltage and verified with the IL700 photometer. •	
	3. Paragraph 4.2.4. The camera shutter is open	
	4. Paragraph 4.2.5. The X-Y scanner is in manual control. The X-Y scanner is checked manually.	
	5. Paragraph 4.2.6. The X-Y scanner is in manual control. The following are defined: • X-start position: • Increment size of X: • Number of increments in X: • Y-start position: • Increment size of Y: • Number of increments in Y:	
	6. Paragraph 4.2.7. The photometer is checked and set to a range of 100 ±5 by varying the HV adjust.	
	7. Paragraph 4.2.8. The f/number is set to the largest aperture as follows: •	

TABLE 4-1 (CONT'D)

PART I - CHECKOUT

PARA REF	DESCRIPTION	INSPECTION
4.2.19 (Cont'd)	8. Paragraph 4.2.9. The X-Y scan is run using the parameters defined in Paragraph 4.2.6 of the data sheet. 9. Paragraph 4.2.10. Repeat Step 4.2.6 for the center vertical scan of film plane.	
4.2.20	All test equipment is turned off.	
4.2.21	Hasselblad camera is removed from calibration setup.	

PARA REF	ADDITIONAL STEPS REQUIRED BY TPS (WHERE APPLICABLE)	INSPECTION

TABLE 4-1 (CONT'D)

PART II - EQUIPMENT ID/DATA RECORDING

TEST TECH: _____

TEST ENGINEER: _____

DATE: _____

TEST EQUIPMENT	S/N	P/N	TEST ARTICLE	S/N	P/N
Photometer, Gamma Model 2020					
Photomultiplier, Gamma Model 2020-1					
Automatic Photometer Scan, NASA No. 86684					
Hasselblad Mounting Fixture					
Beck Hemisphere					
IL700 Research Radiometer					
Variac					
IL700 Detector, PT171C					
Power Source, NASA No. 36129					
Shutter Release Box					
Fiber Optic Probe with Cosine Adapter (cap attached)					

NO.	ADDITIONAL INFORMATION
1.	IL700 CHECK OF HEMISPHERE • Variac set at _____ volts • IL700 ---Function _____ ---Suppression _____ ---Range _____

TABLE 4-1 (CONT'D)

PART II - EQUIPMENT ID/DATA RECORDING

NO.	ADDITIONAL INFORMATION
1. Cont'd	-- Sensitivity factor Variac $1\frac{1}{2}700 \times 10^{-9}$
NO.	REMARKS

TABLE 4-1 (CONT'D)

PART II - EQUIPMENT ID/DATA RECORDING

TEST TECH: _____ TEST ENGINEER: _____ DATE: _____

TEST EQUIPMENT	S/N	P/N	TEST ARTICLE	S/N	P/N
Photometer, Gamma Model 2020					
Photomultiplier, Gamma Model 2020-1					
Automatic Photometer Scan, NASA No. 86684					
Hasselblad Mounting Fixture					
Beck Hemisphere					
IL700 Research Radiometer					
Variac					
IL700 Detector, PT171C					
Power Source, NASA No. 36129					
Shutter Release Box					
Fiber Optic Probe with Cosine Adapter (cap attached)					

NO.	ADDITIONAL INFORMATION
1.	IL700 CHECK OF HEMISPHERE • Variac set at _____ volts • IL700 ---Function _____ ---Suppression _____ ---Range _____

TABLE 4-1 (CONT'D)

PART II - EQUIPMENT ID/DATA RECORDING

NO.	ADDITIONAL INFORMATION
1. Cont'd	-- Sensitivity factor Variac IL700 x 10^{-9}

NO.	REMARKS