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QUARTERLY REPORT

[redacted]

25X1

PAR 211

26 Feb 65

SUBJECT: Microdensitometer Study of Effects of Processing

TASK/PROBLEM

1. Collect and study microdensitometric data from mission materials in an attempt to determine the effect of film emulsions, processing, and printing on the characteristics of image edges. Also, attempt to determine true location of image edges for mensuration purposes.

DISCUSSION

2. Image structure data has been collected on aerial negative film types 4400, 4401, and 4404 in both standard Trenton three-condition processing and in four special developer formulations: Two expected to give high sharpness and two designed to give low graininess. The acutance and granularity measurements for all films and developers have been completed. Approximately two-thirds of the combinations of films and developers have been measured for low-contrast resolving power and modulation transfer function. The data characterizing the image structure of the three films in the above seven conditions of processing is presented in Table I and Figures 1 through 12.

3. The measurements at this stage indicate that the standard Trenton processing produces higher acutance, better low contrast resolving power, and poorer granularity as compared to the four special developer formulations. Since only partial results are known for modulation transfer function, no conclusion can be drawn from this measurement at this time.

4. Supplementary proposals have been written which extend the scope of the image quality measurements and comparisons over that initially planned. These are:

Declass Review by NGA.

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Image Structure Results for Various Chemical Developers

	LOW CONTRAST RESOLVING POWER (LINES/MM)			ACUTANCE GX^2/DS			R.M.S. GRANULARITY $\sigma(D)$			MODULATION TRANSFER FUNCTION, FREQUENCY AT 50% RESPONSE		
	FILM			FILM			FILM			FILM		
ENT	4400	4401	4404	4400	4401	4404	4400	4401	4404	4400	4401	4404
	73	38	185	5650	5950	6200	.018	.034	.014	65	--	111
	73	38	185	5600	7200	6800	.019	.034	.014	77	33	111
	73	38	185	8900	7600	9900	.026	.036	.014	93	69	155
	73	38	185	9100	9100	8400	.033	.049	.013	96	--	146
	82	--	233	11758	6612	12464	.036	.062	.015	--	--	--
DIATE	82	--	233	11732	7713	11272	.036	.062	.014	--	--	--
	73	--	233	10856	7272	13388	.036	.065	.015	--	--	--

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a. Use of medium contrast (6.3:1) resolution measurements.

b. Preparation of aerial scene simulations at a third, larger (23,000:1) scale.

c. Collection of data on low contrast (1.6:1) resolving power and modulation transfer function.

5. The microdensitometer was modified to enable direct punching of density data for use in actuance determinations. Computer programs were written and tested for the IBM 1620 and 7044 computers which take the punched data, check and correct any individual data points that are invalid, smooth the data, and compute the acutance. PAR-232?

6. Seven proposed briefing aid designs were completed and submitted to the customer.

7. Discussions and literature search continues on the problem of mensuration at the limit of resolution.

PLANNED ACTIVITIES

8. Complete the collection of data on low contrast resolving power and modulation transfer function for the three aerial negative films.

9. Start preparing the aerial scene simulations at the scales 100,000:1 and 300,000:1.

10. Begin the measurement of image structure characteristics on the duplicating film Types 5427 and 8430 having standard Dalton processing. See p 9-6 22 Jan report.

11. Continue study of the dimensional measurement of image elements at low signal to noise ratios.

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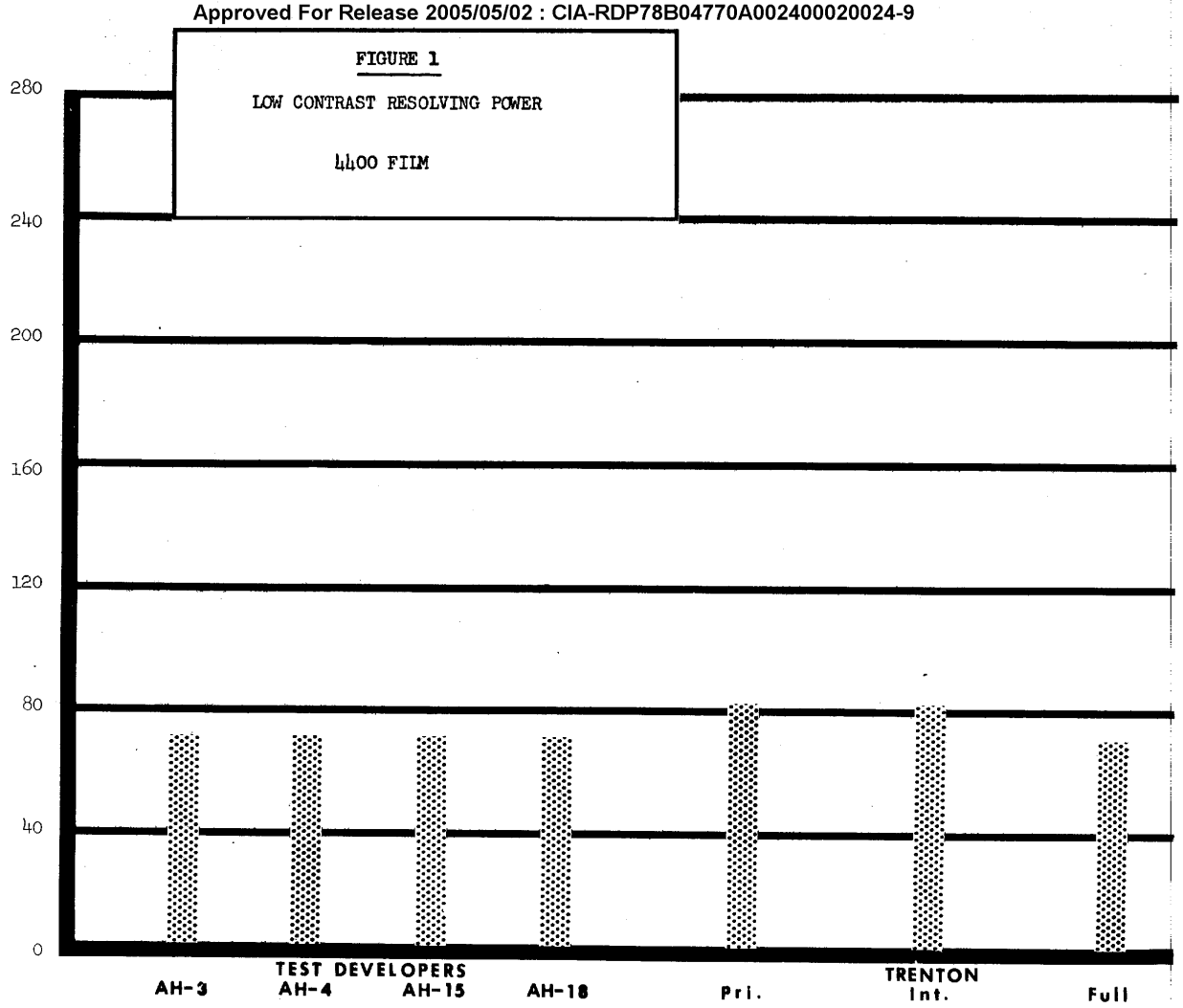

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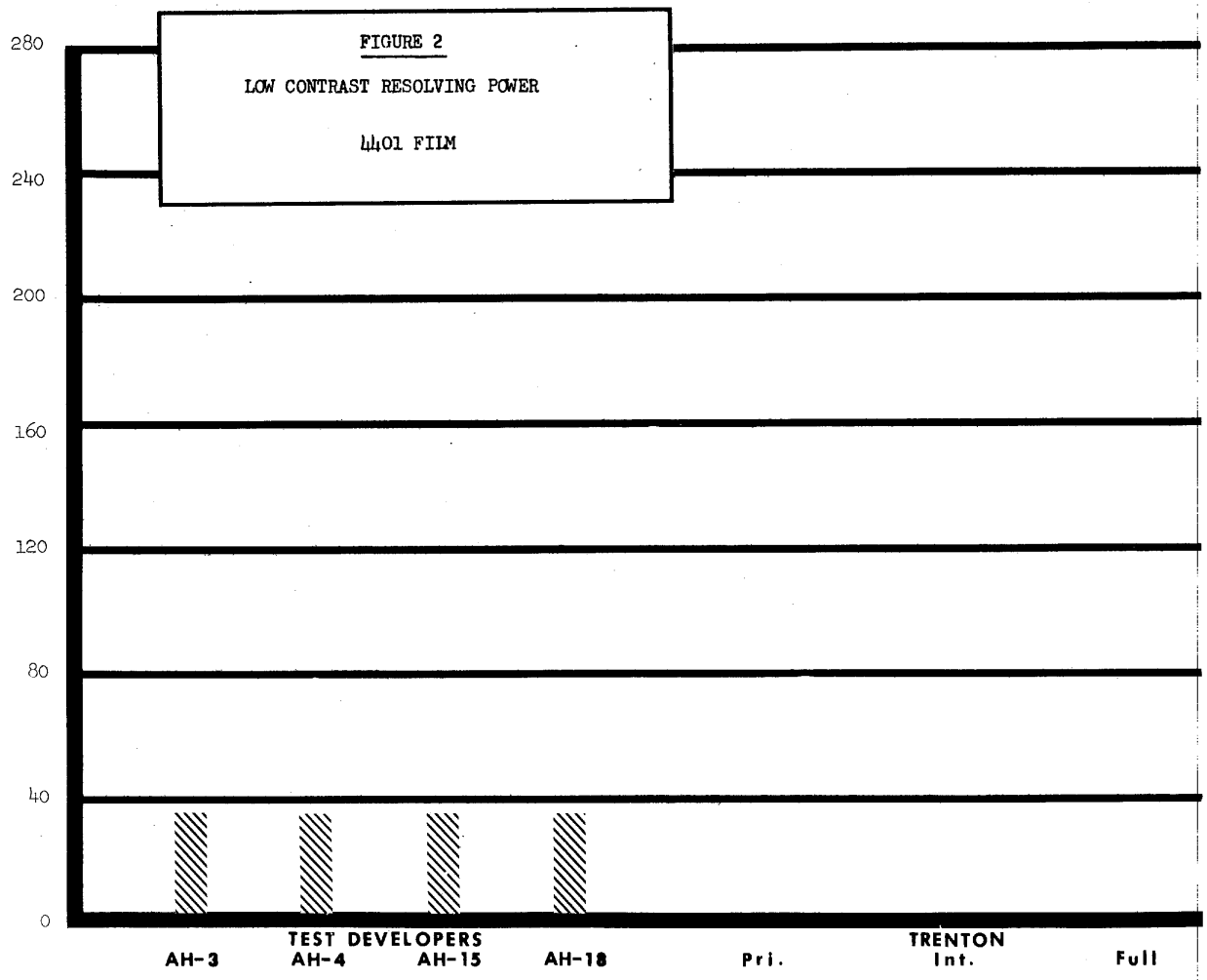

FIGURE 2

LOW CONTRAST RESOLVING POWER

4401 FILM

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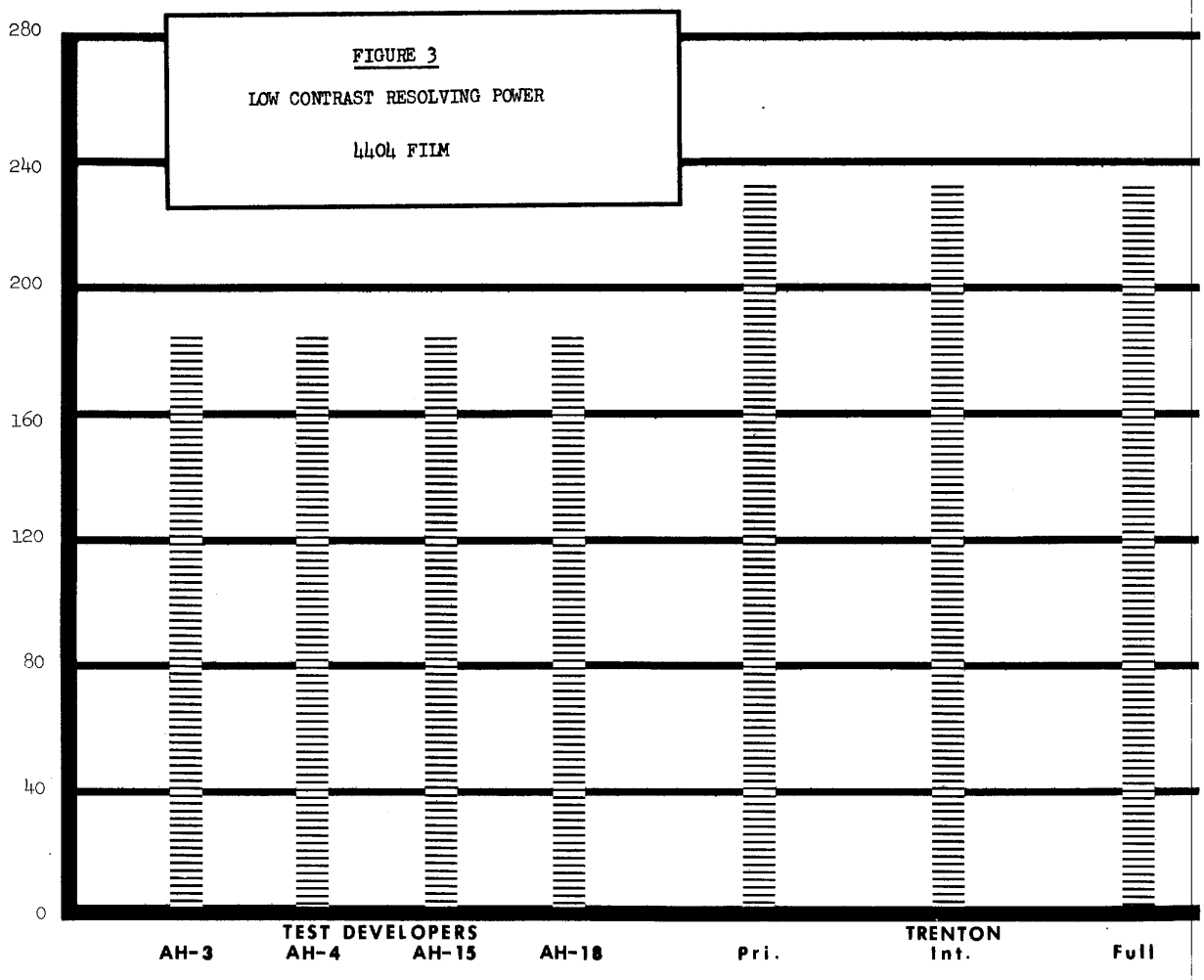

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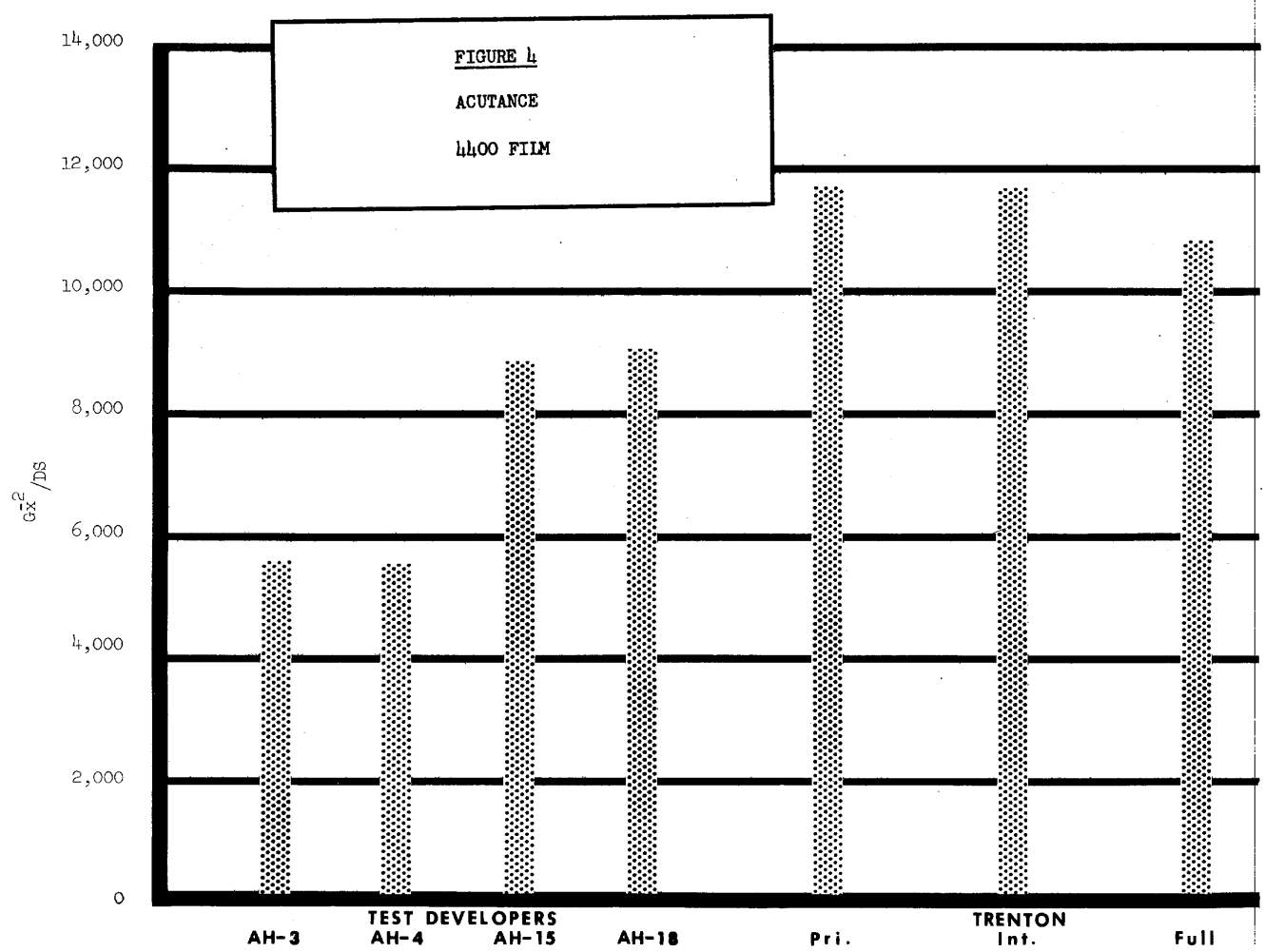

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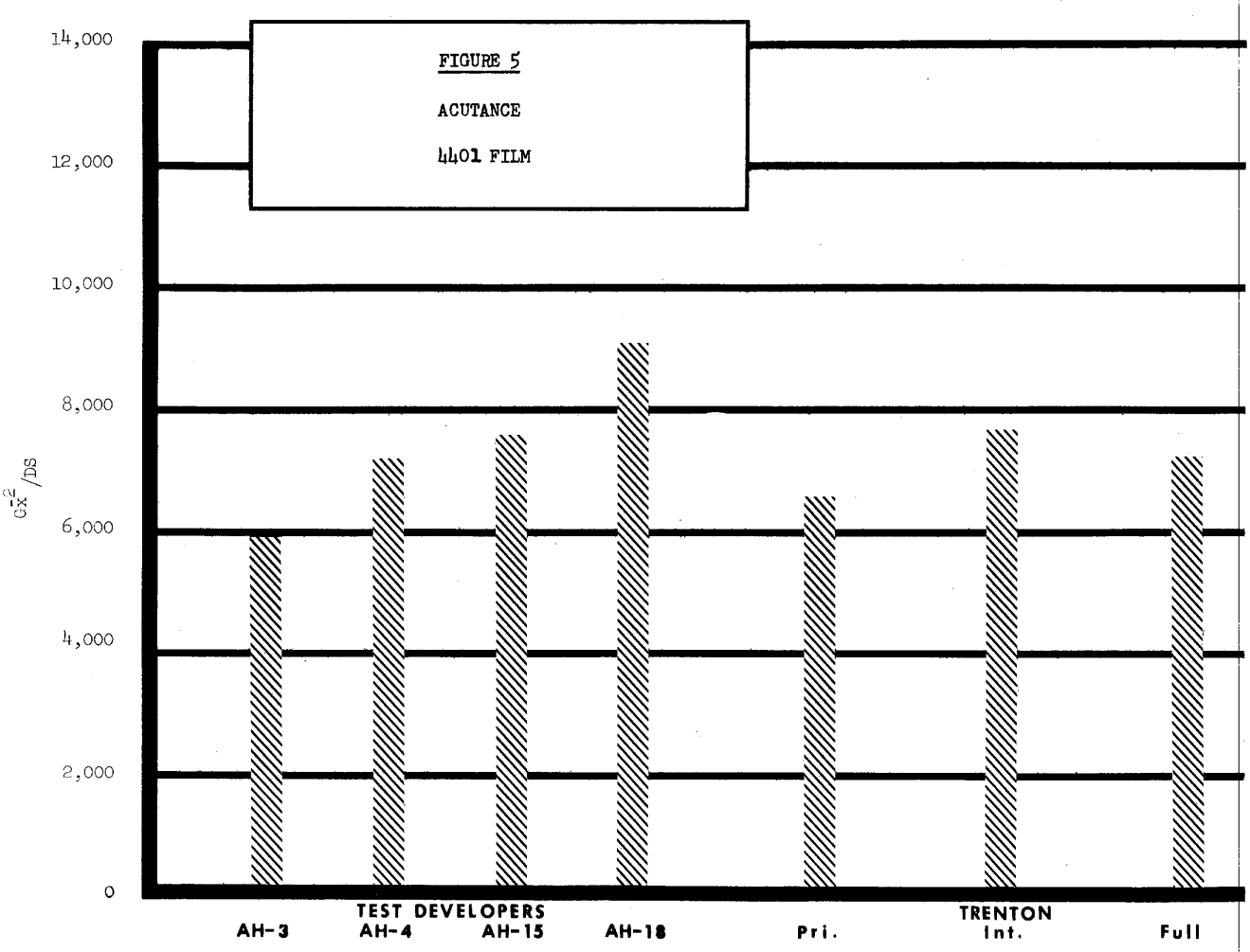

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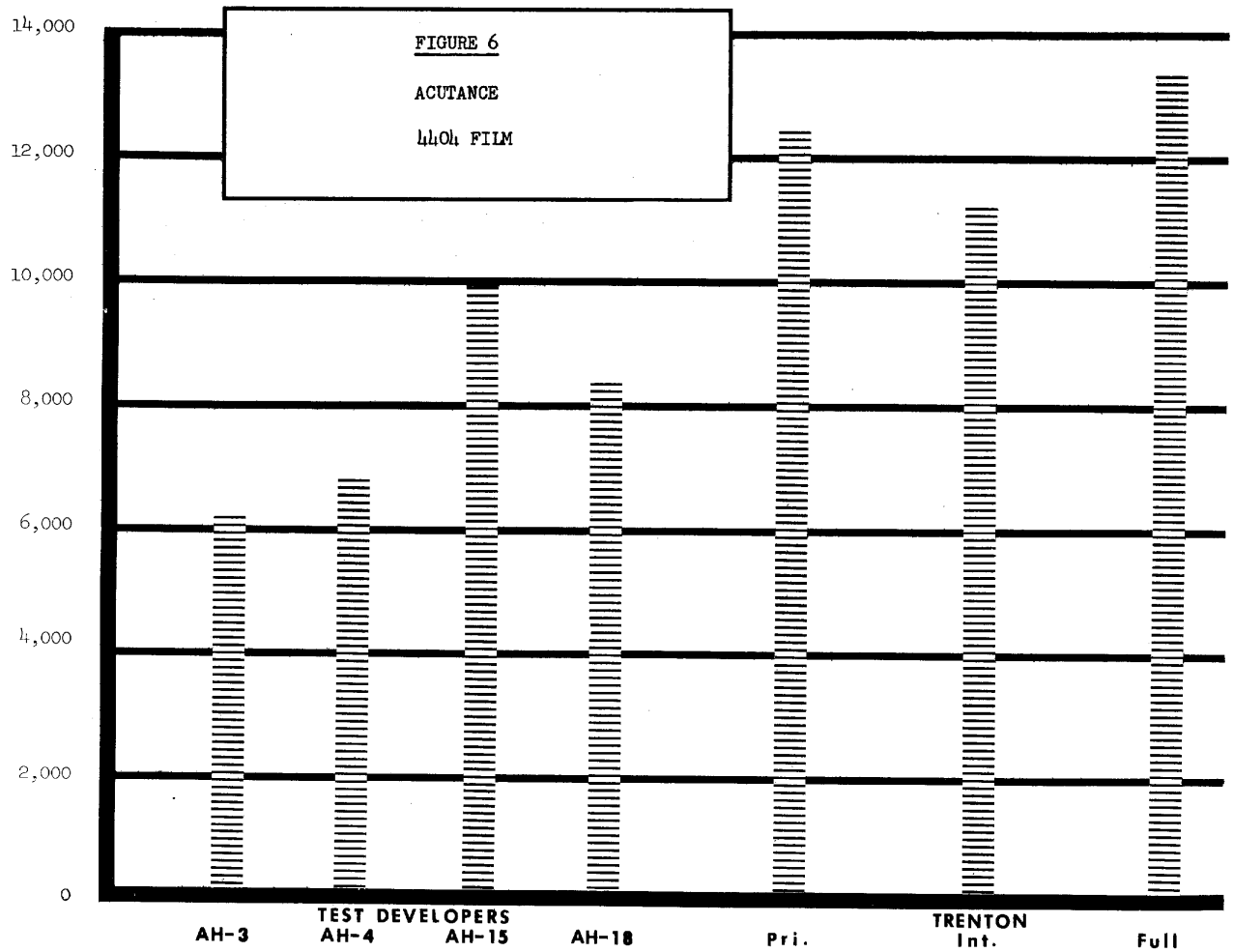

FIGURE 6

ACUTANCE

4404 FILM

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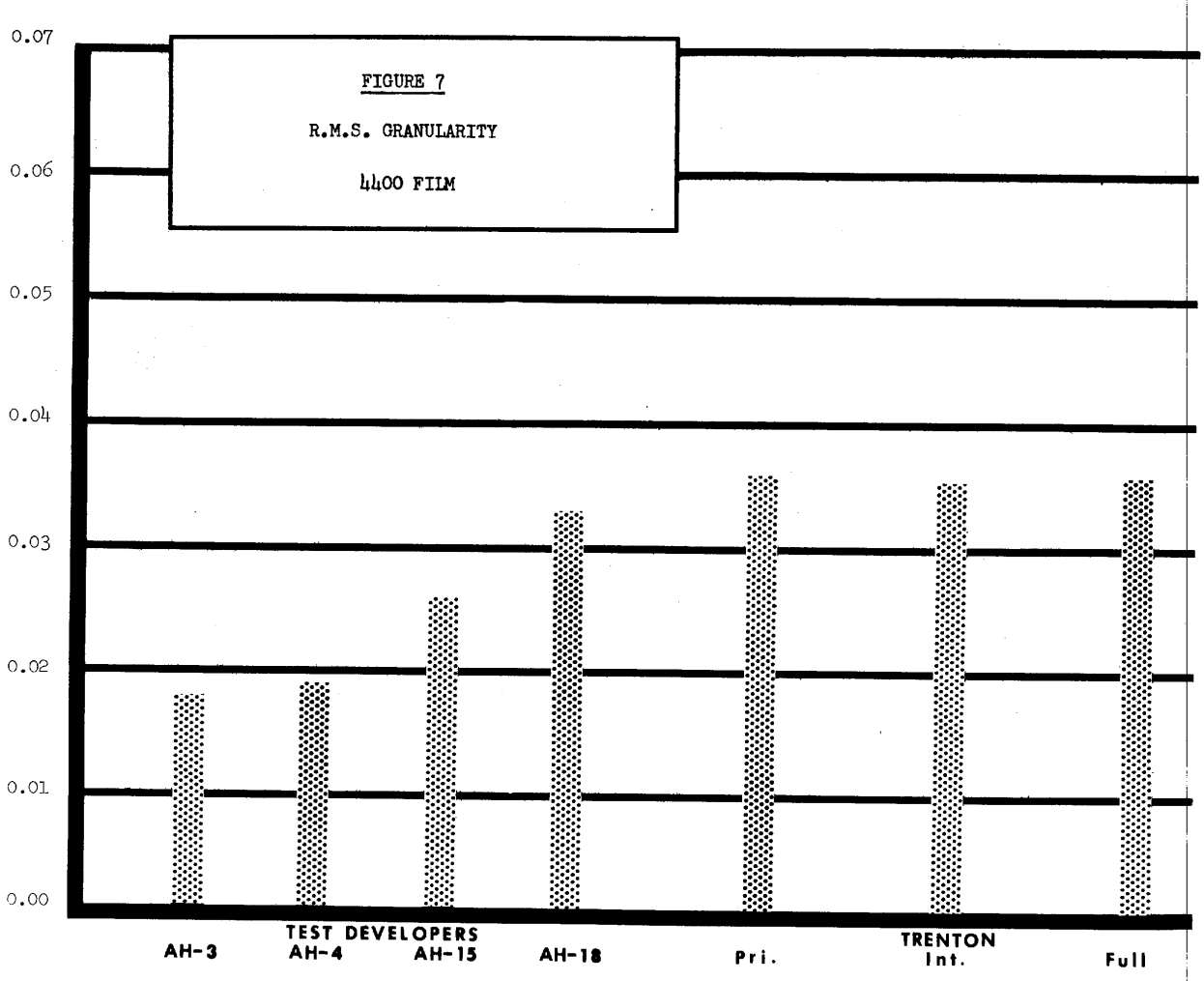

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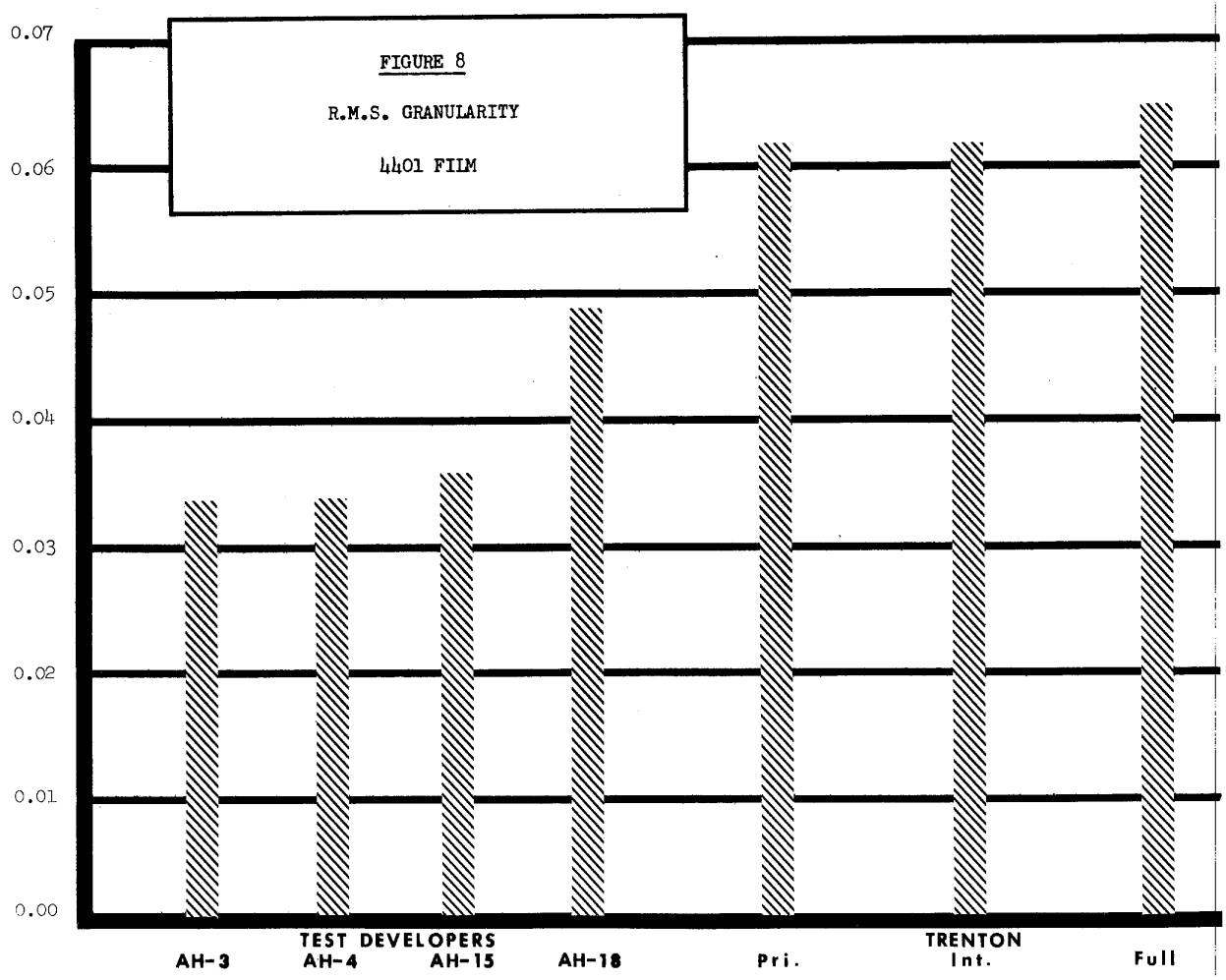

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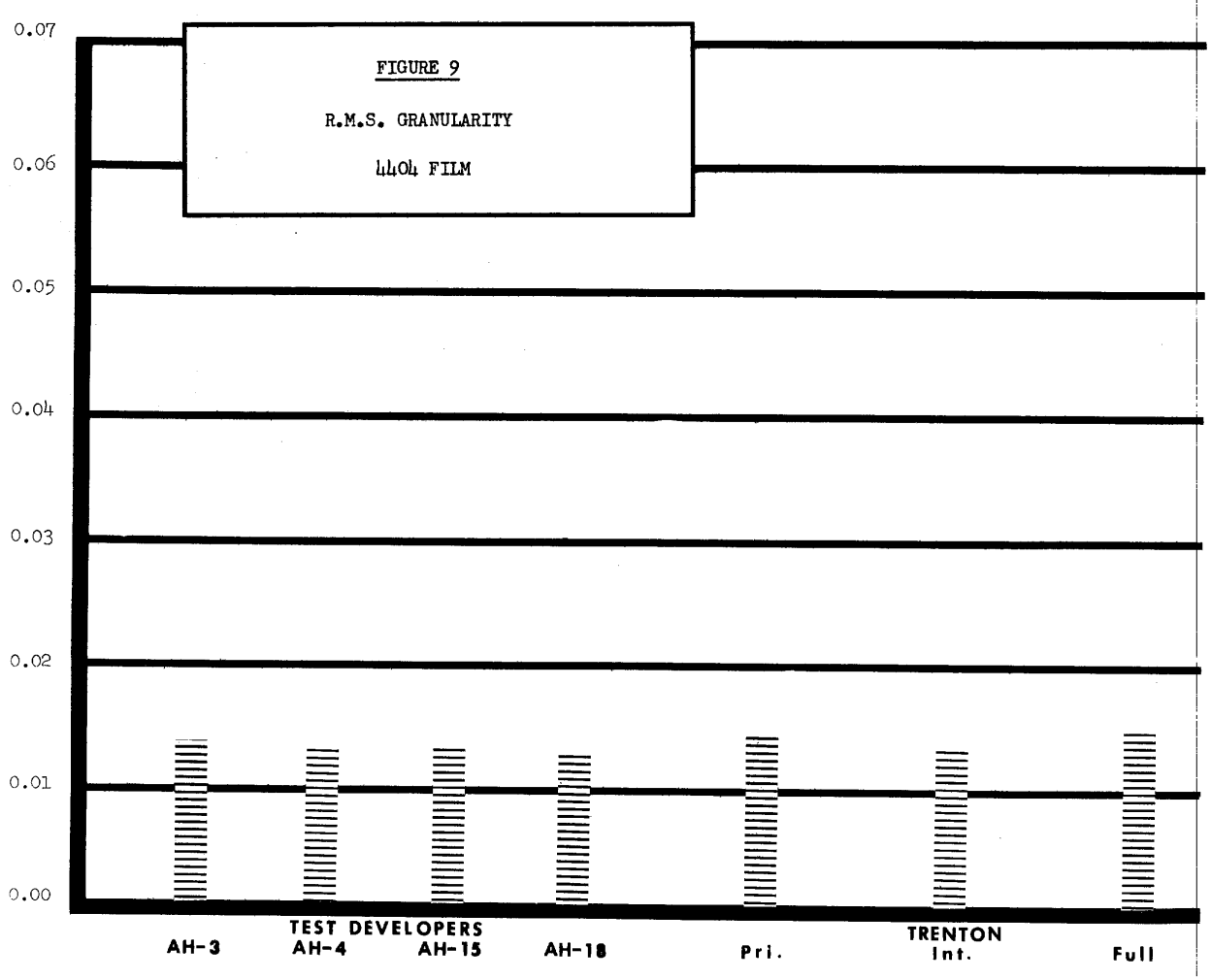

FIGURE 9

R.M.S. GRANULARITY

4404 FILM

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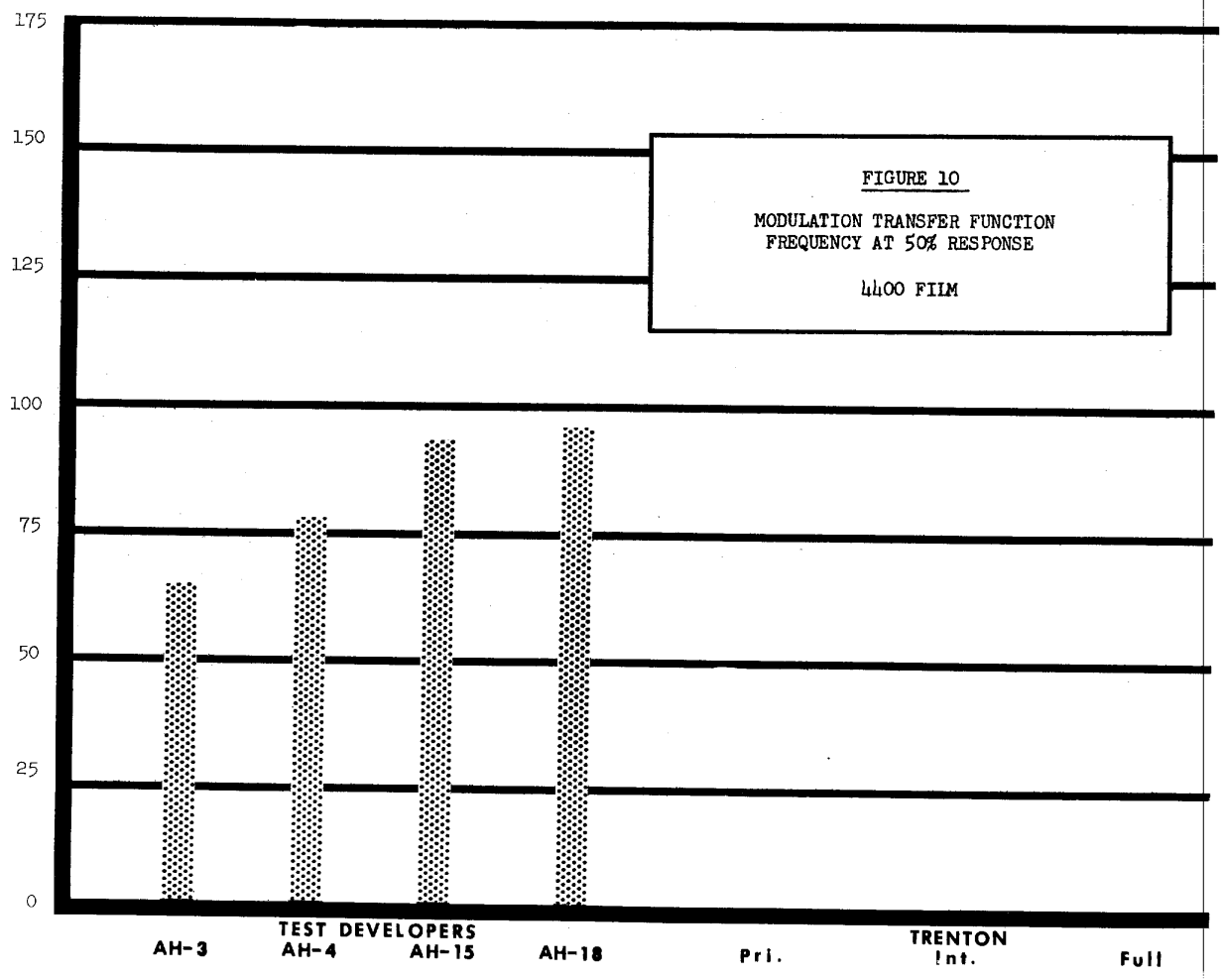

FIGURE 10

MODULATION TRANSFER FUNCTION
FREQUENCY AT 50% RESPONSE

4400 FILM

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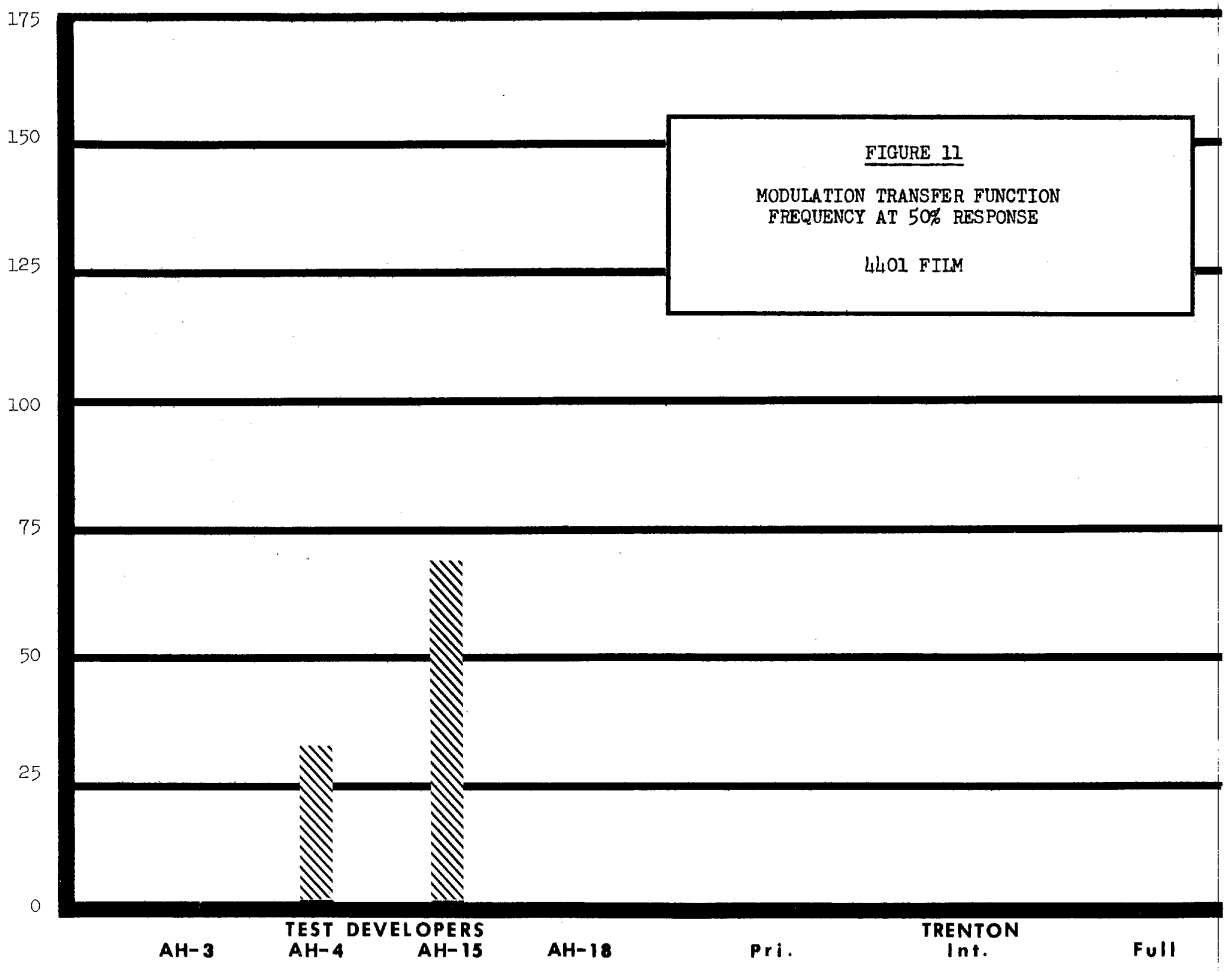

FIGURE 11

MODULATION TRANSFER FUNCTION
FREQUENCY AT 50% RESPONSE

4401 FILM

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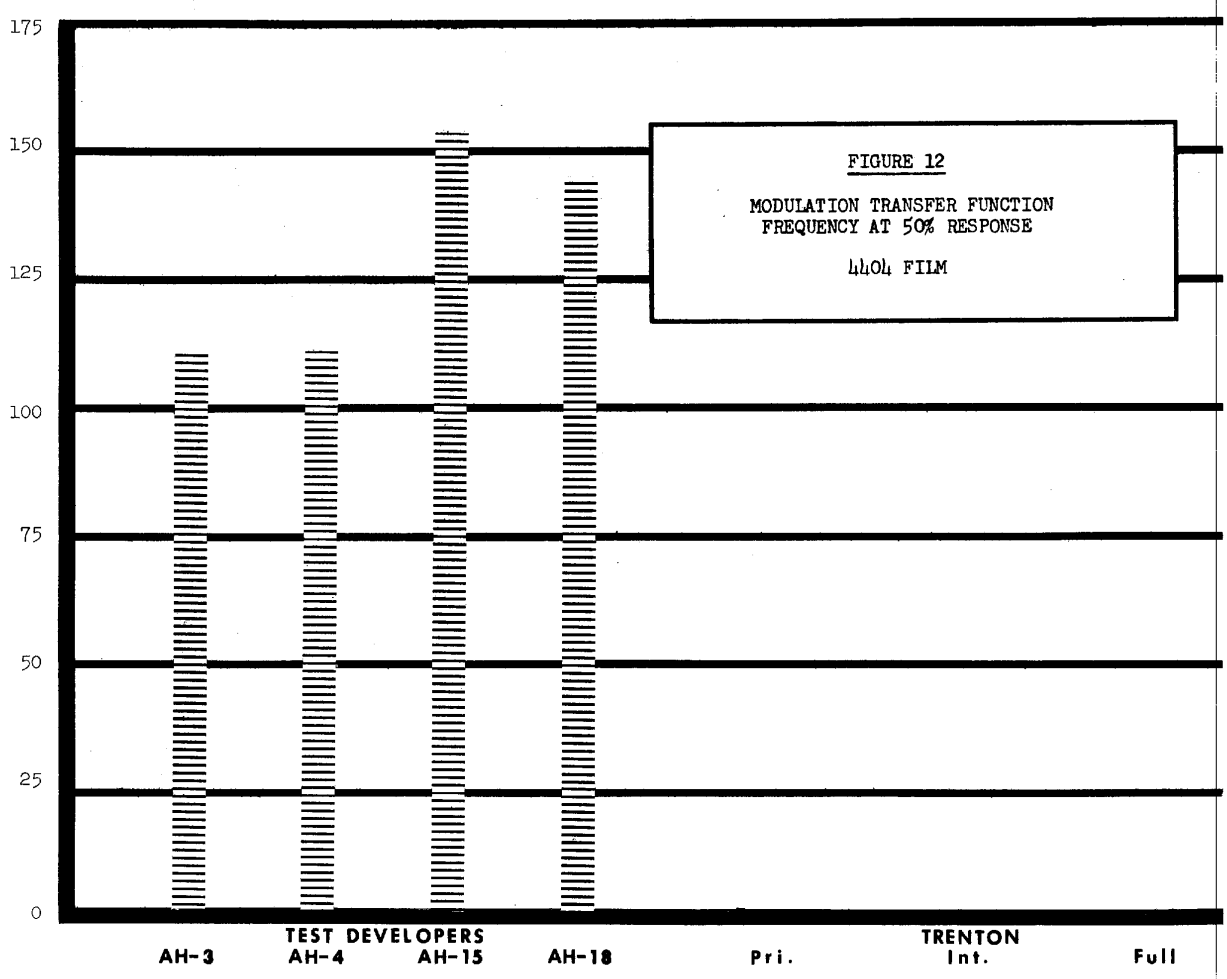

FIGURE 12

MODULATION TRANSFER FUNCTION
FREQUENCY AT 50% RESPONSE

4404 FILM

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