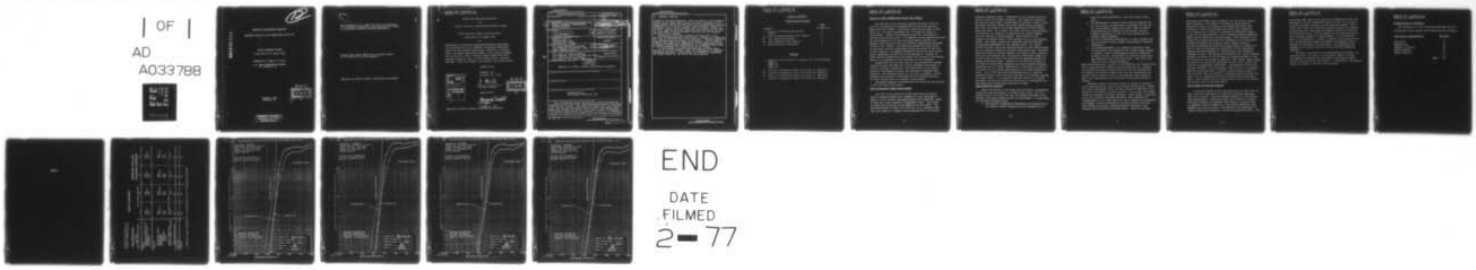
AD-A033 788 METAVAC INC FLUSHING N Y F/G 20/6
PRODUCTION ENGINEERING MEASURES FOR FILTER, INFRARED, INTERFERE--ETC(U)
OCT 76 J MONTE DAAB07-74-C-0379

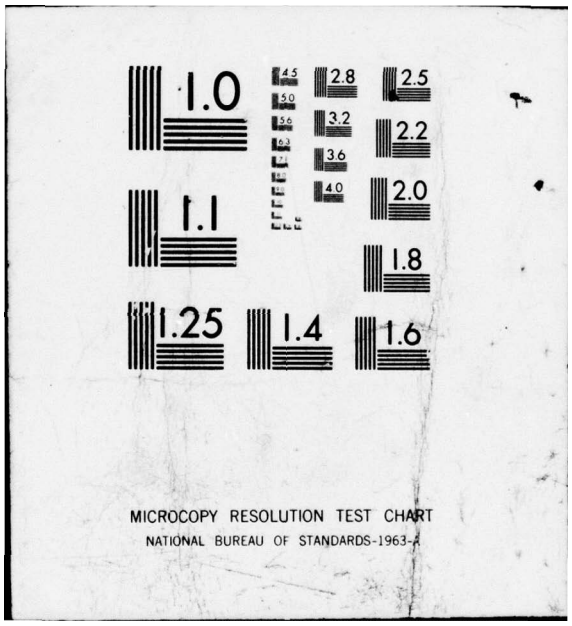
UNCLASSIFIED NL

| OF |
AD
A033788



END

DATE
FILMED
2-77


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

PRODUCTION ENGINEERING MEASURES

INFRARED FILTER for 1KW SEARCHLIGHT AS/VSS-3A

NINTH QUARTERLY REPORT

1 June 1976 to 31 August 1976

CONTRACT NO. DAAB07-74-C-0379

U.S. ARMY ELECTRONICS COMMAND
Ft. Monmouth, NJ

METAVAC, INC.
Flushing, NY

The findings of this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Destroy this report when it is no longer needed. Do not return it to the originator.

Approved for public release; distribution unlimited.

METAVAC, INC. - Flushing, NY
Contract No. DAAB07-74-C-0379

Production Engineering Measures

for

Filter, Infrared, Interference-Absorption Type

Ninth Quarterly Report covering period

1 June 1976 to 31 August 1976

on

Development of Production Engineering Measures undertaken for the production of an Infrared Interference-Absorption Filter for the Infrared Searchlight, AN/VSS-3A, 1 Kilowatt power, including Engineering Samples, First Article samples, and a Pilot Run, under a Contract Number DAAB07-74-C-0379, awarded to Metavac, Inc., of 45-68 162nd Street, Flushing, New York, 11358, by USAECOM, Fort Monmouth, New Jersey 07703.

Submitted by:

METAVAC, INC.
Flushing, NY 11358

J. Monte.

Project Manager

Approved by:

George H. Fadel
President

October 8, 1976

Approved for public release; distribution unlimited

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) PRODUCTION ENGINEERING MEASURES FOR FILTER, INFRARED, INTERFERENCE - ABSORPTION TYPE.		5. TYPE OF REPORT & PERIOD COVERED NINTH QUARTERLY REPORT. no. 9 1 Jun[illegible]-31 Aug[illegible]76, 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) JOHN MONTE		8. CONTRACT OR GRANT NUMBER(s) DAAB07-74-C-0379
9. PERFORMING ORGANIZATION NAME AND ADDRESS Metavac, Inc. 45-68 162nd Street Flushing, NY 11358		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2749523
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Electronics Command Fort Monmouth, New Jersey 07703 Code: AMSEL-PP-I-PI-I		12. REPORT DATE 8 October 1976 13. NUMBER OF PAGES 12
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) U.S. Army Electronics Command Fort Monmouth, New Jersey AMSEL-PP-I-PP-I AND U.S. Army Electronics Command Fort Belvoir, VA 22060 AMSEL-NVSD		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

12 17p.

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Infrared Filter
Searchlight, AN/VSS-3A, 1KW

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Work accomplished during the previous Quarter included preparations for the Pilot Run, and continuing testing of additional First Article filters. Data taken from these tests were coordinated with the test data from previous filters and specific problem areas examined in detail. One filter, number 29 exhibited an unusually high spectral transmission, as well as a difference between the lightest and darkest areas which reached the maximum

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

227100 ZB

20. ABSTRACT (CONT'D)

allowed by the specifications. This was traced to an accidental failure of the motor which rotates the glass cylinders in the vacuum chamber during the deposition of the interference coatings. Examination of the motors on other vacuum chambers revealed no systematic cause, and no remedial action was taken, except that the motor reducing-gear box inspection and lubrication (as needed) were added to the maintenance procedure for the equipment assigned to this program.

Scheduling of the tests required and described in the Critical Item Specification will become a problem in a Production Run, such as the Pilot Run of this Contract. Informal studies of these problem areas were begun in the Quarter, and a letter of proposal was prepared for submission to the Contracting Officer, to design and make some rapid-action test equipment which could be used successfully in a production run of filters.

It was planned to perform the Pilot Run of filter manufacture in the next Quarter, under the observation of cognizant Government personnel. Preparations are planned for beginning the General Report at the end of the next quarter.

METAVAC, INC. - FLUSHING, NY
Contract No. DAAB07-74-C-0379

TABLE OF CONTENTS

NINTH QUARTERLY REPORT

		Page
ABSTRACT		DD FORM 1473
I.	Purpose of Work Done During This Quarter	1
II.	Work Accomplished During This Quarter	2
III.	Test Scheduling Problems	2
IV.	Work Planned for Next Quarter	4
V.	Identification of Personnel	6

APPENDIX

i. Summary of Test Results according to Doc. C2a 2204010306
   Table I
   Table II
   Table III
   Table IV

ii. Spectral Transmission curves for Filter no. PEM-FA-27

iii. Spectral Transmission curves for Filter no. PEM-FA-28

iv. Spectral Transmission curves for Filter no. PEM-FA-29

v. Spectral Transmission curves for Filter no. PEM-FA-30

METAVAC, INC. - Flushing, NY
Contract No. DAAB07-74-C-0379

PURPOSE OF WORK ACCOMPLISHED DURING THIS PERIOD:

The work done in the previous quarter period for this contract was concentrated on preparations for the Pilot Run Production Article filters. Particular attention was paid to items which may, in a major production run, be causes for delay or interruption. Among the manufacturing and test procedures receiving close scrutiny were: (a) freshness of the sealant materials; (b) end treatment of the glass cylinders before tinting; (c) Angular Visual Security test; (d) spectral transmission and Figure of Merit; and, finally, (e) Radiation Reliability (life) tests. In each case, Previous experiences during the course of the work in this contract, or problems encountered during the First Article phase, emphasized the need for close examination. Results of these detailed examinations and studies will be part of the General Report to be submitted at the conclusion of this contract.

Preparations for the Pilot Run of filter production included release of glass cylinders for tinting, purchase and receipt of critical materials required for the fabrication of the vacuum-deposited interference coating, end sealing of assembled glass cylinders, and mechanical parts for the filter assembly. Vacuum chambers were cleaned in accordance with the planned schedule, and work stations were also cleaned in due course.

Government approval to proceed with the Pilot Run was received at the very end of the Period.

WORK ACCOMPLISHED DURING THIS QUARTER:

The last of the series of filters made during the First Article production phase were submitted to tests according to Table I of the Critical Item Specification C2a 2204010306, dated 27 July 1973, and to spectral transmission tests. The results of these tests are given in the Appendix to this report. The Calculated Figure of Merit for filter No. 29 is unusually high. This was traced to a slightly high transmission in the 795-830

nanometer spectral region. Examination of the coating run sheets did not reveal any unusual occurance. The change was traced to the electric motor which, through built in gearing, slowly rotates the glass cylinders during the actual vacuum coating procedure. This motor was found to be without lubrication and the internal gears were worn. As a result, the inner and outer glass cylinders of filter No. 29, coated in succession in the vacuum chamber, were not rotated at uniform speeds. This resulted in the lightest and darkest areas of the coatings to go to the tolerance limits. The Figure of Merit was calculated from the spectral transmission measurement of the lightest areas. As a result of this incident, the glass rotating motors at each vacuum station were re examined closely for internal lubrication loss. The motor which had failed to operate properly was found to have a crack in the gear-train housing seal, and the gear lubrication leaked out, but at a rate too slow to be noticed by the operators during the normal maintenance cycles. Because of its critical position in the chain of action which comprises the vacuum coating procedure, inspection and, if needed, lubrication of this motor was added to the check list for routine maintenance of the vacuum coating stations, The 1/75 HP hysteresis synchronous motor is entirely powerful enough to drive the glass cylinder in its holder, through the vacuum joint. It is believed that the failure is a random occurance, and need not cause any difficulty in a production run, when appropriate maintenance measures are taken.

TEST SCHEDULING PROBLEMS:

During the testing of the First Article Filters, accomplished during the previous Quarter, it became obvious that, for a production rate of 10 filters per day, the methods described in the Critical Item Specification may not be satisfactory. In particular the following problems arose:

1. The spectral transmission measurement and calculation of the Figure of Merit requires the full operation of at

least two spectrophotometers, and, more likely, three units.

2. The measurement of Angular Visual Security requires the use of at least one operational searchlight and the use of a satisfactory outdoor test range. This is further complicated by the vagaries of the weather, and disturbing illumination of the full moon, making many available nights unuseable.
3. The test of Radiation Reliability, or life, requires the use of as many as three useable searchlights to maintain scheduling.
4. Few spectrophotometers are capable of measuring transmittance below .001 percent in the visible range, rapidly. At present, double monochromators backed by additional blocking filters, and operated on a point by point basis can reach this level with consistency. This also slows down the filter testing schedules.

These difficulties may, in part, be alleviated by the careful selection of representative samples from the Pilot Run lot. However, the Critical Item Specification indicates that all filters must be examined for spectral transmission, and the accompanying calculated Figure of Merit as well as the Angular Visual Security. Thus, some consideration has been given to alternate methods of testing.

Alternate methods of testing should be capable of detecting filter characteristics which are not within specification. Beyond this basic requirement, there are many avenues of approach to the design of test methods for these filters. In any case, the methods should have certain preferable features: rapid reading, convenient to use by relatively untrained personnel, small enough to be transportable to U.S. Army Depots for use in repair and maintenance, and capable of being calibrated by and with filters which have been checked by the more elaborate methods described in the Critical Item Specification C2a2204010306. Among the possible

approaches are methods which integrate over the entire spectral range specified. For example, the Figure of Merit might be determined directly by sensing of the transmitted flux from a calibrated 1 KW arc lamp through the filter with a photocell and a combination of filters to simulate the specified response in the red and near infrared. This integrated-spectrum detection method can be extended to include Angular Visual Security by detecting the visible radiation with a photocell and filters which simulate accurately the scotopic visual response function. The Metavac engineering staff has already begun an informal program of study to determine the feasibility of the integrated-spectrum detection approach to rapid factory-level testing of assembled filters. The Radiation Reliability test (life) requires exposure of filters to the arc lamp for extended periods of time. It is practical to consider a simplified lamp, holder, power supply and timer as a fixture for performance of this test, without the need for an operational searchlight. Consideration of this plan has been included in the preliminary study of these test problems. Metavac will propose that a specific study program be added to this contract, with the purpose of generating working designs and models of test apparatus which could satisfy those needs noted above. This proposal will be made in letter form to the Contracting Officer early in the next quarter.

WORK PLANNED FOR THE NEXT QUARTER

In the next Quarter period, the Pilot Run of filters will be made, under the observation of cognizant Government personnel. Tests will continue, using the methods specified in the Critical Item Specification. Particular study will be made of the Manufacturing Procedure to determine what changes in process steps or equipment might be needed for a much larger production rate. Emphasis will also be given to the detection and measurement of typical performance variations, within the specified limits. This

has already been done in the case of the connection between AVS measurements and the calculated Figure of Merit, for the Manufacturing Procedure employed in this Contract program. The informal study into test scheduling problems begun by the Metavac engineering staff during the last Quarter period will continue on an informal level, with the purpose of providing the Government with some guidance in these problems, in the General Report of this Contract. A letter of proposal will be sent to the U.S. Army Electronic Command outlining a more specific add-on program for the design and constructio of rapid-action test apparatus to be tried as aids in solving the test scheduling problems.

Test data, observation of the Manufacturing Procedure, and program results, as given in the Quarterly reports is being rearranged and organized for inclusion in the General Report, and will continue in the next Quarter. Preparation of the General Report will begin at the end of next Quarter.

METAVAC, INC. - Flushing, NY
Contract No. DAAB07-74-C-0379

IDENTIFICATION OF PERSONNEL:

The following is a list of Metavac personnel who have contributed to the program effort during the Ninth Quarter:

Engineering & Manufacturing	Man Hours
John Monte	20
Kenneth Trnka	20
Kenneth A. Riccardi	40
Ernest Zappulla	20
Edward Antonison	40
TOTAL	140

APPENDIX

METAVAC INC.-FLUSHING, NY
Contract # DAAB07-74-C-0379

SUMMARY OF TEST RESULTS

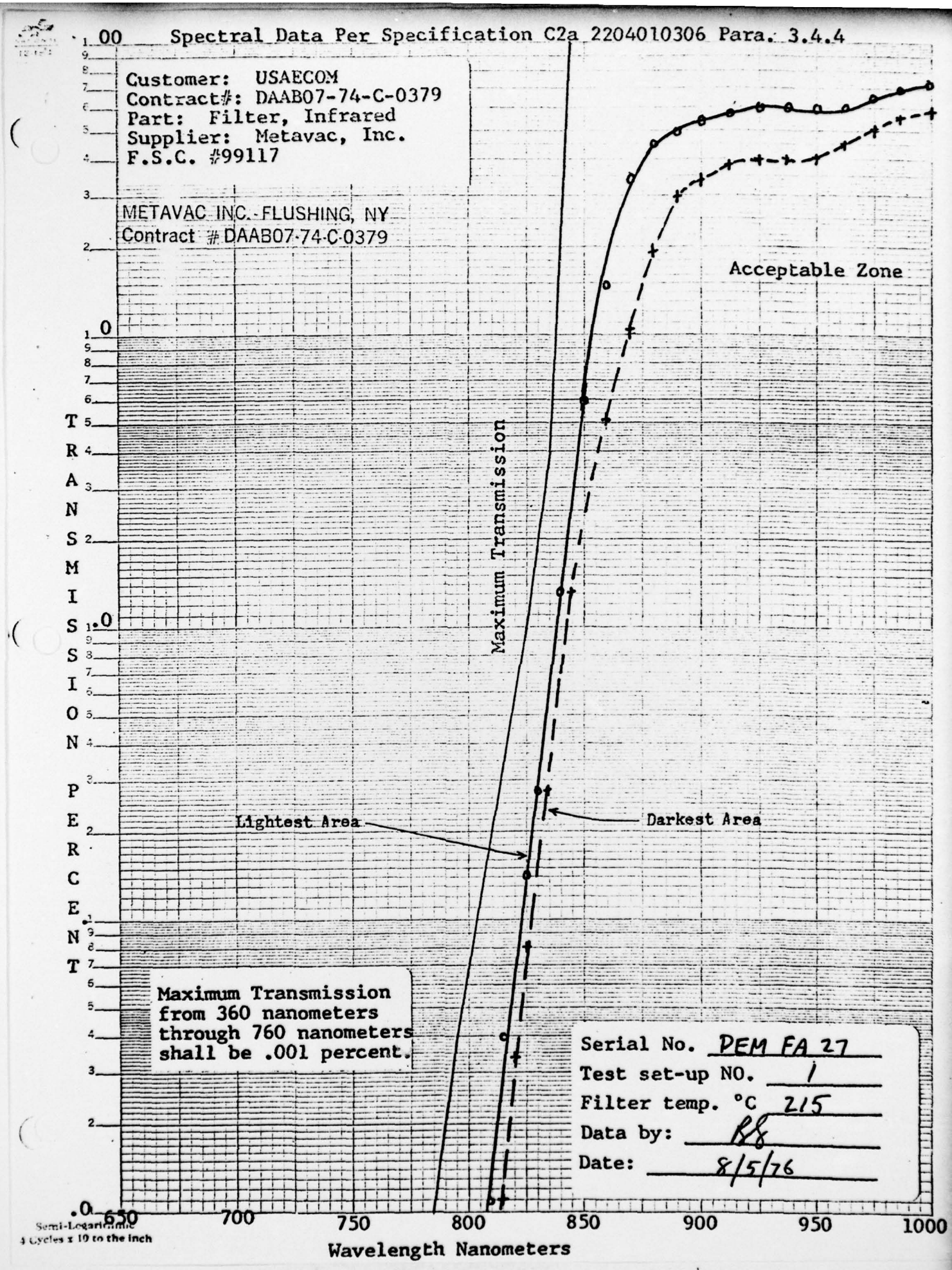
First Article Filters

Summary Date: Aug. 5, 1976

Test Document: C2a2204010306

Test Item Table Number (test document)	Filter Number (Metavac) 27	28	29	30
TABLE I				
Damage and visible Defects	none	none	none	none
Identification numbers	correct	correct	correct	correct
Workmanship	good	good	good	good
TABLE II				
Interference coating	good	good	good	good
Coating bond	excellent	excellent	excellent	excellent
Cleanability				
Soapy water	good	good	good	good
Alcohol	good	good	good	good
Spectral Tranmittance	see attached curves			
Figure of Merit - calculated	199.2	195.4	232.3*	181.9
Angular Visual Security	NA	NA	NA	NA
TABLE III	NA	NA	NA	NA
TABLE IV	NA	NA	NA	NA

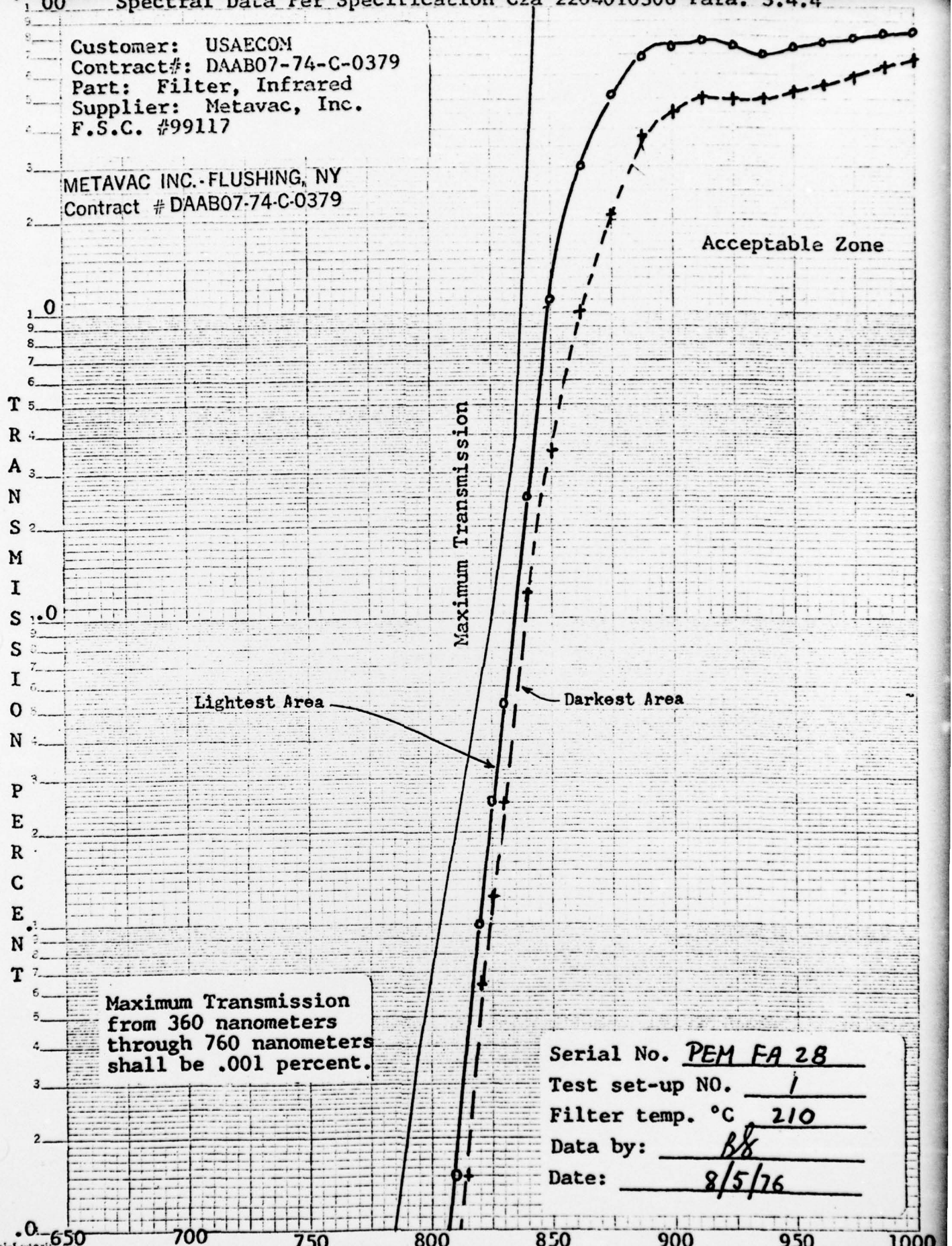
* This filter shows a difference of 4.0 millimicrons in the 1 % transmittance wavelength


Spectral Data Per Specification C2a 2204010306 Para. 3.4.4
Customer: USAECOM
Contract#: DAAB07-74-C-0379
Part: Filter, Infrared
Supplier: Metavac, Inc.
F.S.C. #99117
METAVAC INC. FLUSHING, NY
Contract # DAAB07-74-C-0379
Acceptable Zone
Maximum Transmission
Lightest Area
Darkest Area
TRANSMISSION PERCENT
Wavelength Nanometers
650
700
750
800
850
900
950
1000
Maximum Transmission from 360 nanometers through 760 nanometers shall be .001 percent.
Serial No. PEM FA 27
Test set-up NO. 1
Filter temp. °C 215
Data by: BB
Date: 8/5/76
Semi-Logarithmic
4 Cycles x 10 to the inch

100 Spectral Data Per Specification C2a 2204010306 Para. 3.4.4

Customer: USAECOM
Contract#: DAAB07-74-C-0379
Part: Filter, Infrared
Supplier: Metavac, Inc.
F.S.C. #99117

METAVAC INC.-FLUSHING, NY
Contract # DAAB07-74-C-0379



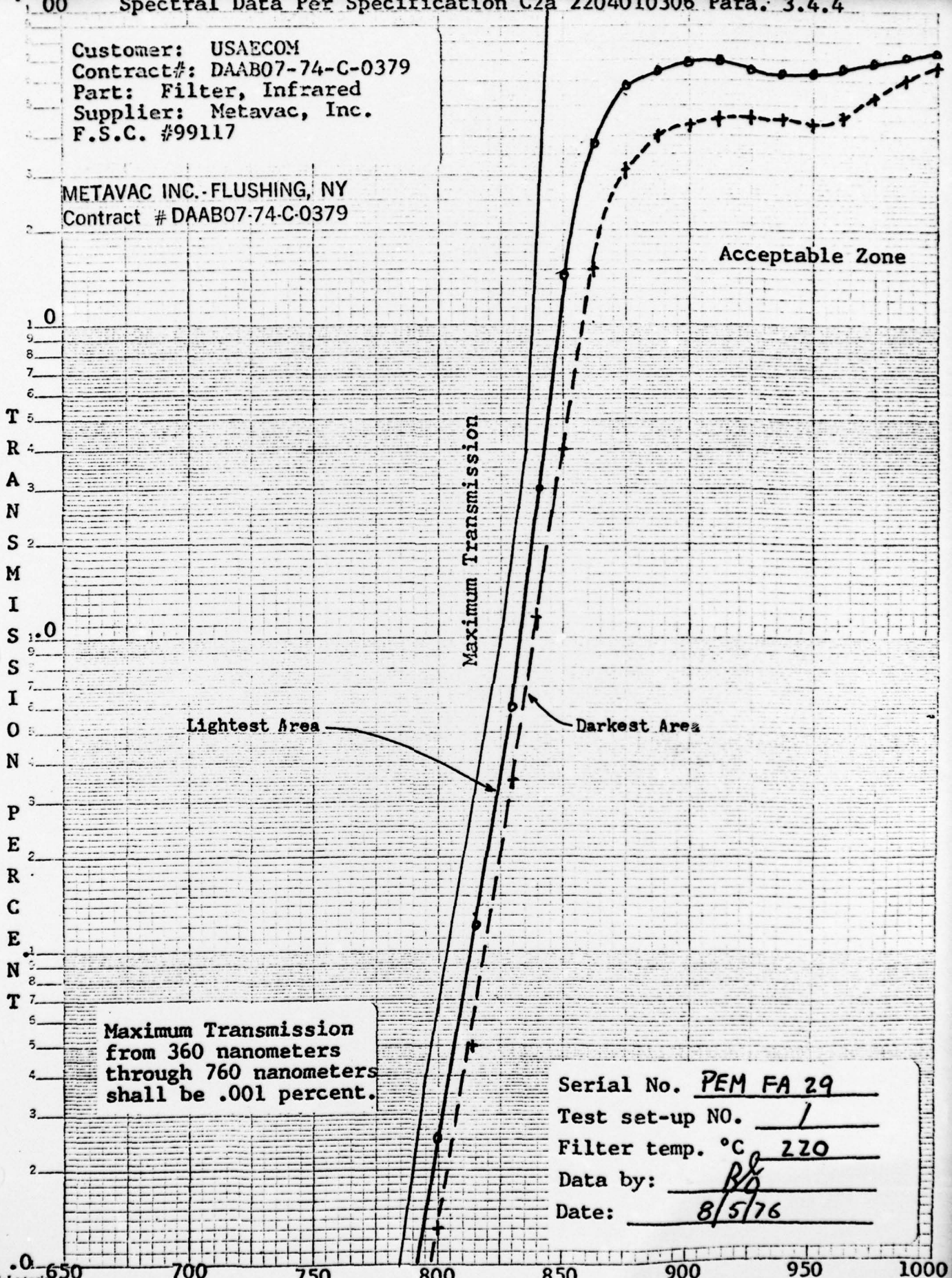
Maximum Transmission from 360 nanometers through 760 nanometers shall be .001 percent.

Serial No. PEM FA 28
Test set-up NO. 1
Filter temp. °C 210
Data by: BB
Date: 8/5/76

100 Spectral Data Per Specification C2a 2204010306 Para. 3.4.4

Customer: USAECOM
Contract#: DAAB07-74-C-0379
Part: Filter, Infrared
Supplier: Metavac, Inc.
F.S.C. #99117

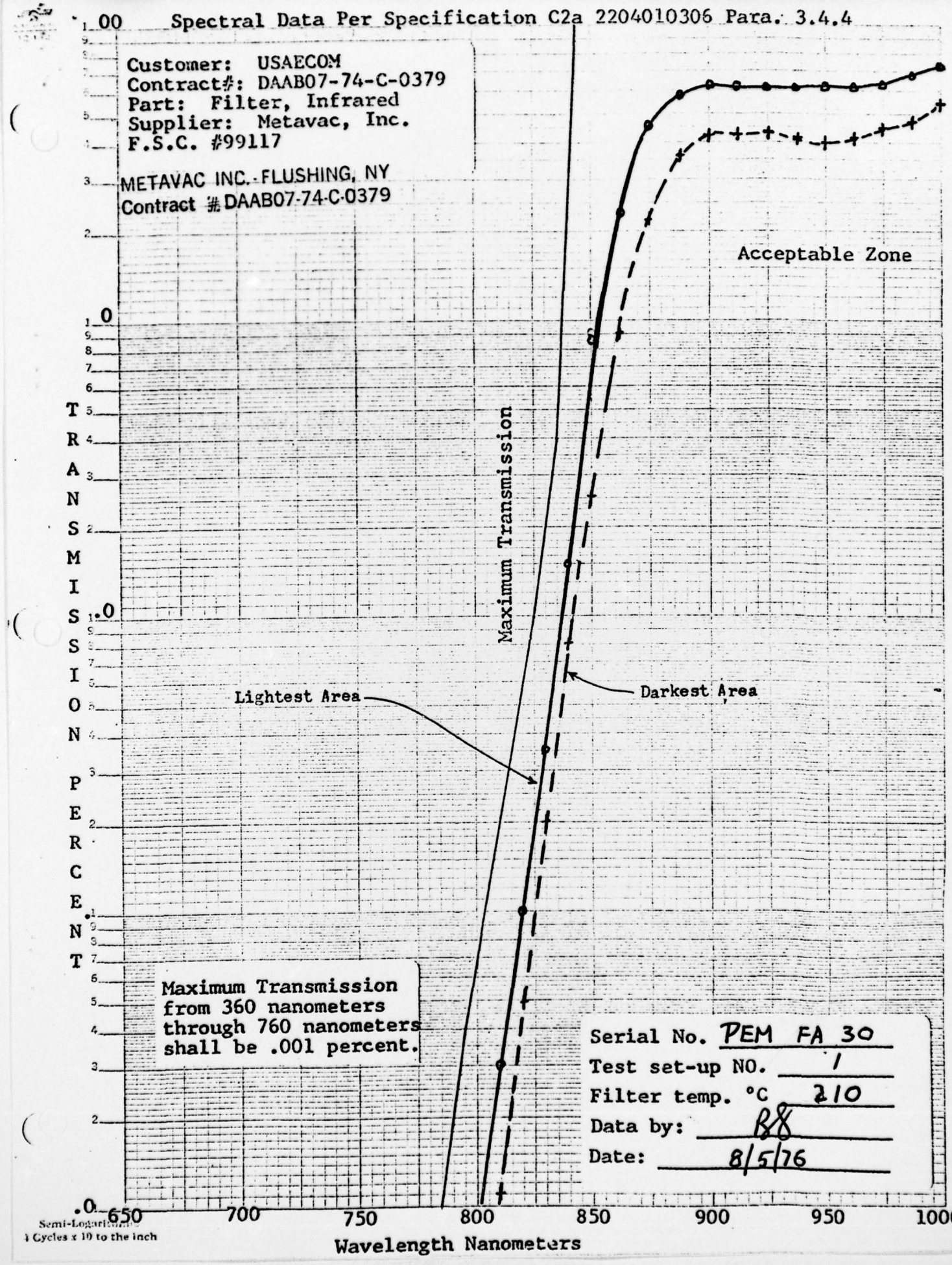
METAVAC INC. - FLUSHING, NY
Contract # DAAB07-74-C-0379



Maximum Transmission from 360 nanometers through 760 nanometers shall be .001 percent.

Serial No. PEM FA 29
Test set-up NO. 1
Filter temp. °C 220
Data by: RG
Date: 8/5/76

Semi-Logarithmic
4 Cycles x 10 to the inch


Spectral Data Per Specification C2a 2204010306 Para. 3.4.4
Customer: USAECOM
Contract#: DAAB07-74-C-0379
Part: Filter, Infrared
Supplier: Metavac, Inc.
F.S.C. #99117
METAVAC INC. FLUSHING, NY
Contract # DAAB07-74-C-0379
Acceptable Zone
Maximum Transmission
Lightest Area
Darkest Area
TRANSMISSION PERCENT
100
10
1.0
.0
Maximum Transmission from 360 nanometers through 760 nanometers shall be .001 percent.
Serial No. PEM FA 30
Test set-up NO. 1
Filter temp. °C 210
Data by: BB
Date: 8/5/76
650
700
750
800
850
900
950
1000
Wavelength Nanometers
Semi-Logarithmic
3 Cycles x 10 to the inch