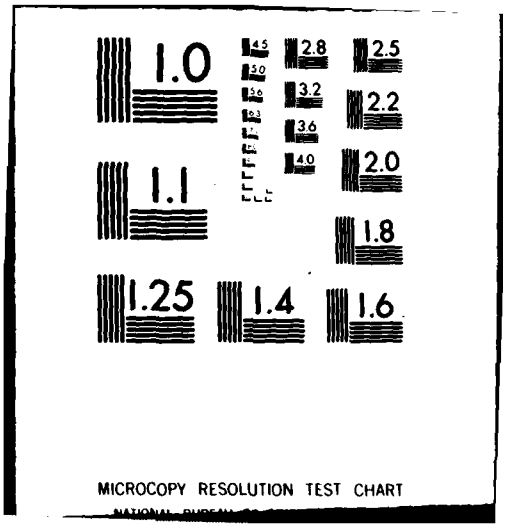
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This test operations procedure (TOP) provides a standard method for performing radiac ratemeter directional dependence tests to determine the ratemeter response to radiation emanating from different directions relative to the test item.

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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

DRSTE-RP-702-105
Test Operations Procedure 6-2-562
AD No.

(11) 19 November 1980

(6) RATEMETER DIRECTIONAL DEPENDENCE, RADIAC

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(9) Final rept. on test operations procedure.

1.0 SCOPE

This test operations procedure (TOP) provides a standard method for performing radiac ratemeter directional dependence tests to determine the ratemeter response to radiation emanating from different directions relative to the test item.

2.0 FACILITIES AND INSTRUMENTATION

2.1 Facilities

A physically secure enclosure or building which provides attenuation of all ionizing radiation from within to no greater than two milliroentgen per hour at its outer walls or established perimeter.

2.2 Instrumentation

Item	Accuracy
Secondary Standards (e.g., AN/UDM-1, AN/UDM-1A J.L.S. MDL 138, x-ray)	Corrected to 3 percent with source calibration correction factors applied.
Radiation Measuring Devices (RMD) (e.g., Condenser "R" meter, Victoreen MDL 555 Radocon II OPTICAL Support Equipment)	+2 percent of full scale reading (Rdg).

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Instrumentation

Item	Accuracy
Barometer	±0.25 mm (100th inch) Hg.
Thermometer °C or °F	±1/2°C or 1°F.
Warning Device (audio/visual)	Sensitive to 2 mR/H.
Photodosimetry Film Badge	±10%
Pocket Dosimeter (0-200 mR)	±10%
RADIACMETERS	±10%
Timer, minutes	±1 second.
Voltmeter	

3.0 PREPARATION FOR TEST

3.1 Facilities

Inspect facilities for conformance to minimum requirements and that all safety alarms and controls are operating.

3.2 Equipment

Select radiation measuring devices ideally having an accuracy of at least ten times that of the Ratemeter being tested, and with calibrations traceable to the National Bureau of Standards (NBS). Select secondary standards (Radioactive Sources) which provide dose rates, types, and energy levels specified in the instructions furnished with or applicable to the ratemeter under test and with calibrations traceable to NBS.

3.3 Personnel

Ensure that all test personnel are familiar with the required technical and operational characteristics of the ratemeter being tested and the operational and safety requirements applicable to the Radioactive source being used.

3.4 Instrumentation

Set up and check all instrumentation in accordance with technical manuals, technical bulletins, or manufacturers' specifications applicable to the radioactive source or x-ray used, and the ratemeter under test.

Set up and position the radiation measuring devices in the same location as the detecting element of the ratemeter under test.

3.5 Data Required. Record the following:

3.5.1 Test Item. Type No., Model, Serial No., Nomenclature and manufacturer as applicable, including manufacturer's technical characteristics.

3.5.2 Instrumentation. Type, Model, Serial Number, Nomenclature, Manufacturer, and Date of last calibration.

3.5.3 Personnel Data. Technicians Name, Grade and MOS/Series if applicable.

4.0 TEST CONTROLS

4.1 The source, ratemeter under test, radiation measuring device and warning devices will be set up inside the secure area.

4.2 Test personnel will wear the assigned photodosimetry film badge and pocket dosimeter while in the secure area.

4.3 Ensure that appropriate security measures are instituted to preclude any entrance into the secure area while the sources are in an exposed condition.

4.4 Thoroughly inspect the ratemeter(s) under test for obvious physical and electrical defects and self-contained battery conditions.

4.4.1 All defects will be noted, corrected and recorded before proceeding with the test.

4.5 Perform all precalibration checks in accordance with the operations manual.

5.0 PERFORMANCE TEST

5.1 Test Preparation

5.1.1 Ascertain the distance between the source and ratemeter under test, from the Source Correction-Factor Table and Calibration Charts, necessary to expose the ratemeter under test, for a predetermined on-scale reading.

5.1.2 Place the positioning carriage the distance from the source ascertained in para 5.1.1 above.

5.1.3 Place the ratemeter under test on the carriage, positioned and oriented as shown in the applicable source TM to obtain a baseline reading. Material supporting the ratemeter shall be composed of a low (Z) atomic number (e.g. aluminum) and have a low total mass.

5.1.4 When required, set up the associated optics system so that the indicator and dial scale of the ratemeter under test may be clearly observed.

5.1.5 Turn on the ratemeter and all associated instrumentation, and allow sufficient time for thermal equilibrium to be attained.

5.1.6 Select a ratemeter display range consistent with the expected dose rate, to show an approximate midscale reading on the ratemeter.

5.2 Performance

5.2.1 Expose the ratemeter under test to radiation, observe the reading (value) obtained.

5.2.2 Record the following:

a. Background reading at ratemeter prior to exposure.

b. Source(s) used.

c. Selected dose rate to which the ratemeter was exposed.

d. Results of reading(s) on calibrated meter scale for each level of radiation used.

e. The radiation measuring device reading, with the temperature and barometric pressure correction factor applied.

f. Any instability or erratic behavior of the ratemeter under test.

g. Distance between source and ratemeter.

5.3 Directional Dependence

5.3.1 Maintain the distance between the source and ratemeter under test to give the selected dose rate in para 5.1.1 above. Rotate the ratemeter in two planes: a complete 360° turn in the horizontal plane with respect to the source, and in the vertical plane through 180° starting at the calibration direction (source) and moving away from the ground (upward) direction. Record the observed readings at selected increments in both planes. See TOP 6-2-561.

5.3.2 After each reading, tap or vibrate the test item and again expose, observe and record the reading.

5.3.3 Investigate and record any meter imbalance (No Radiation Shall Be Applied During This Portion of Test) by tapping the meter as it is rotated about its axis in 90° increments.

6.0 DATA REDUCTION AND PRESENTATION

6.1 Present the data in tabular and/or graphical form showing:

a. Baseline readings obtained versus radiation measuring device readings and energy of radiation.

b. Baseline readings obtained versus all other readings obtained during rotation of the ratemeter about each of its three mutually perpendicular axes (x and y plane, and x and z plane or y and z plane).

6.2 Use the meter indication in the calibration direction (baseline) to evaluate readings taken in the complete 360° horizontal plane with respect to the source, and in the vertical plane through 180° starting at the calibration direction and moving away from the ground direction (upward).

6.3 The data will be reviewed to determine if the ratemeters under test meet the specified ratemeter directional dependence requirements.

6.4 The test item specification requirements will be noted on the test data presentation to facilitate analysis and comparison.

6.5 Record and present dosages IAW Title 10, Code of Federal Regulations, United States Nuclear Regulatory Commission, Part 20, Chapter I, Paragraph 20.401.c.1.

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APPENDIX A

SAMPLE FORM FOR RADIAC RATEMETER DIRECTIONAL DEPENDENCE TEST DATA COLLECTION AND TEST DATA COMPILATION

Ratemeter:
Type No. _____ MDL No. _____ Serial No. _____ Nomenclature _____ MPG _____

Instrumentation	Type/MDL No.	Serial No.	Nomenclature	Manufacturer	Calibration Date

Source: _____

Pre-Cal Checks	Baseline	Directional Response	Meter Balance
Physical _____	(1) Dose Rate _____	Dose Rate _____	Zero Set _____
Battery _____	RMD Rdg _____	Meter Rdg, Pre Tap: ___ Post Tap: ___	At ___ 0/360° _____
Pre-Cal _____	Ratemeter Rdg _____		At ___ 45° _____
	(2) Dose Rate _____	Dose Rate _____	At ___ 135° _____
	RMD Rdg _____	Meter Rdg, Pre Tap: ___ Post Tap: ___	At ___ 225° _____
	Ratemeter Rdg _____		At ___ 315° _____
	(3) Dose Rate _____	Dose Rate _____	
	RMD Rdg _____	Meter Rdg, Pre Tap: _____ Post Tap: ___	
	Ratemeter Rdg _____		

Data Taken By _____ Grade _____ MOS/Series _____

APPENDIX B

RATEMETER DIRECTIONAL DEPENDENCE CHECK LIST

1. Facility conforms to requirements. _____
2. Instrumentation in calibration. _____
3. Name, Grade and MOS/Series of Person taking data recorded. _____
4. Instrumentation data recorded. _____
5. Test item data recorded. _____
6. Pre-Cal data recorded. _____
7. Data reduced. _____
8. Physical personnel security confirmed. _____
9. Personnel safety indoctrination. _____

Each item is to be initialed by the person in charge.

