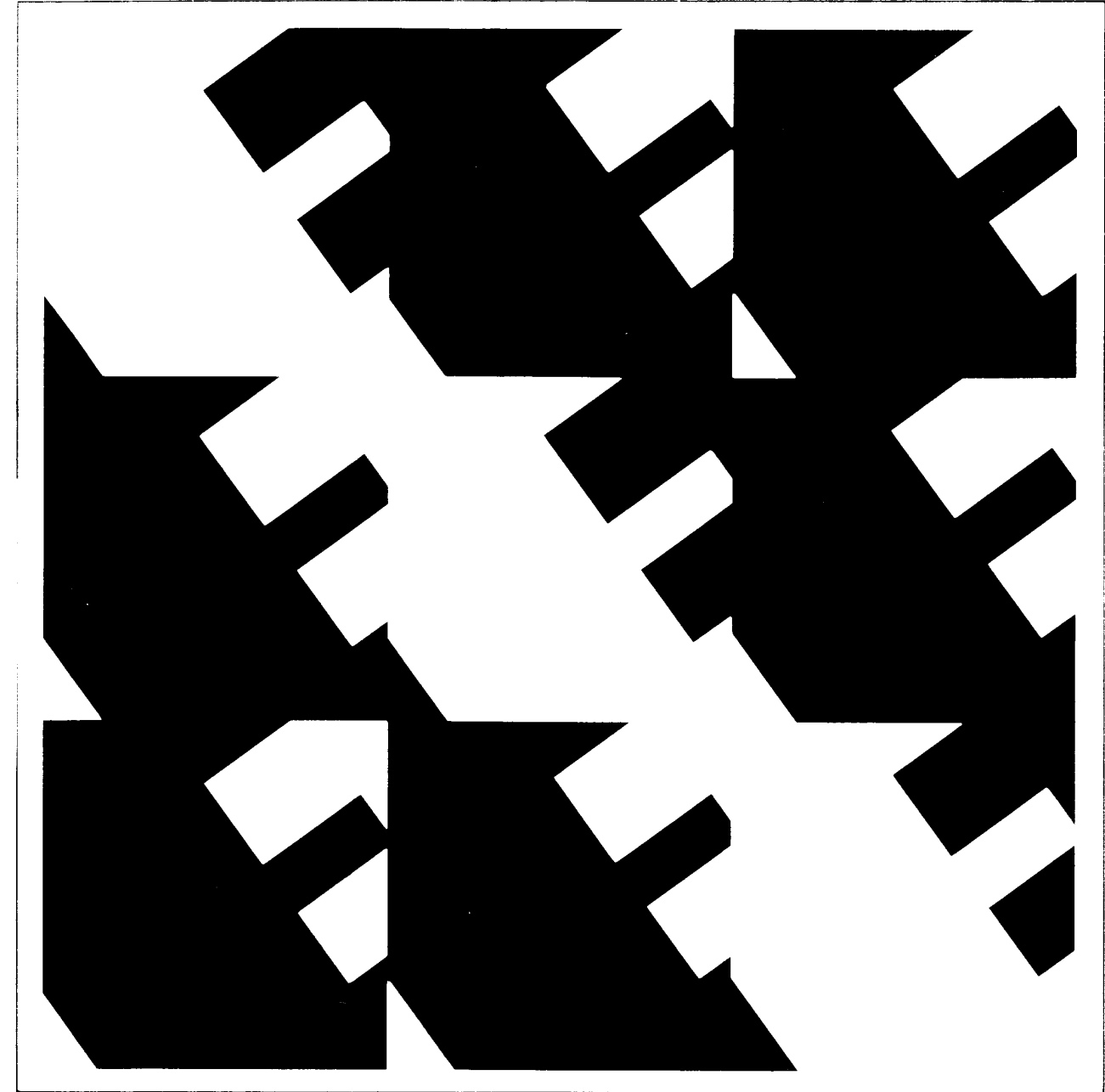


IEEE Standard Application Guide for Bolometric Power Meters

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Foreword

(This Foreword is not a part of IEEE Std 470-1972, Application Guide for Bolometric Power Meters.)

Bolometer power measurement instrumentation is generally used to measure the average power of electromagnetic waves propagating in a single mode in waveguide or coaxial transmission lines below 100 mW and above 10 MHz. The power range can be extended by the use of attenuators or directional couplers, or both. This standard was developed in order to facilitate communication between manufacturers and users, and to establish a common means for making comparisons between instruments of different manufacturers. It is hoped that this standard will promote uniformity in the information supplied by manufacturers of bolometric power meters.

The work of preparing this standard was carried out by the Subcommittee on Power Measurements of the IEEE Instrumentation and Measurements Group Technical Committee on High-Frequency Instruments and Measurements. The membership of the subcommittee is as follows:

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IEEE Standard

Application Guide for Bolometric Power Meters

1. Purpose

The purpose of this standard is to document the minimum information that users of bolometric power meters may need. It will also provide potential purchasers and others with a common means for making comparisons between instruments and will provide a uniformity of information among manufacturers.

2. Scope

This standard applies to bolometric power meters as complete instruments and to their constituent parts: bolometric detectors, bolometer units, and bolometer elements. Bolometer power measurement instrumentation is generally used to measure, below 100 mW and above 10 MHz, the average power of electromagnetic waves propagating in a single mode in waveguide or coaxial transmission lines. The power range can be extended by the use of attenuators or directional couplers, or both.

3. Required and Optional Information To Be Supplied

3.1 Required (Minimum) Information. Information and equipment description, operating conditions, and performance characteristics shall be supplied on, at least, each of the items listed in Table 1 under "Required."

3.2 Optional (Additional) Information. Listed in Table 1 under "Optional" are some items that may be important in some applications. Information on these items may be optionally supplied by the manufacturer or requested by the user. Any additional information deemed desirable may also be supplied by the manufacturer.

3.3 Standards for Information. All of the subsequent sections are for the purpose of establishing a common understanding of meaning, content, conditions, and validity of informa-

tion that is supplied or requested in accordance with this standard.

4. Specifications for Required and Optional Information

This section gives standards for content and scope of the information to be supplied on the items listed in Table 1.

4.1 Identification. Give the manufacturer's name and address and the type or model and serial number for the equipment.

4.2 Classification. Using the list on Table 2 as a guide, classify the equipment for which information is being supplied.

4.3 Physical Description. Give outside dimensions, weight, and other important physical properties such as whether the equipment is portable or rack- or bench-mounted. A sketch or photograph showing front panel controls of the bolometer bridge should be included. Specify the type of RF connector used for the input of the bolometer unit.

4.4 Measurement and Bias Ranges. Give the power measurement and bias current ranges and describe the readout and/or bias control provisions. State whether ranging is manual or automatic. Meter scale and/or control dial subdivisions and marking shall be included in the description. For digital readouts specify number of digits.

4.5 Frequency Range. Give the recommended frequency range for the spectrum of electromagnetic waves applied at the input for power measurement.

4.6 Accuracy. Clearly define the uncertainty in percent or decibels with which the value of a quantity can be measured or assigned. For complete power meters it is the uncertainty in the measurement of the power that a source of RF power is capable of delivering to a non-reflecting (Z_0) load. For bolometer units it is the uncertainty in the assigned value for cali-

Table 1
Required and Optional Information

	Required	Optional	Power Meters	Bridges	Units	Elements
1. Identification	*		o	o	o	o
2. Classification	*		o	o	o	o
3. Physical Description	*		o	o	o	o
4. Measurement and Bias Ranges	*		o	o		
5. Frequency Range	*		o		o	o
6. Accuracy	*		o	o	o	
7. Operating Conditions						
7.1 Ambient temperature and humidity	*		o	o	o	
7.2 Line power or battery voltage	*		o	o		
7.3 Bolometer operating resistance, R	*		o	o	o	
7.4 Bias current for R	*				o	o
8. Extreme Conditions						
8.1 Maximum (safe) bias current	*				o	o
8.2 Maximum (safe) input power	*		o		o	o
8.3 Tolerance to environmental stresses		*	o	o	o	o
8.4 Electromagnetic compatibility		*	o	o	o	
8.5 RF power amplitude modulation restrictions		*				
9. Compatible Instrumentation			o	o	o	o
10. Operation and Maintenance	*		o	o	o	
11. Performance Characteristics						
11.1 SWR	*		o		o	
11.2 Complex reflection coefficient		*	o		o	
11.3 Zero carryover	*		o	o		
11.4 Long-term stability		*	o			
11.5 Short-term stability	*		o	o		
11.6 Supply voltage variation effect	*		o	o		
11.7 Ambient temperature variation effect	*		o	o	o	
11.8 Resolution	*		o	o		
11.9 Calibration factor	*		o		o	
11.10 Effective efficiency		*	o		o	
11.11 Effective efficiency variations		*	o		o	
11.12 Mismatch uncertainty		*	o		o	
11.13 Minimum measurable power		*	o			
11.14 Power-temperature coefficient		*			o	o
11.15 Resistance modulation		*			o	o
11.16 Ambient temperature time constant	*		o		o	
11.17 Power indication response time	*		o			

Table 2
Classification

A. Bolometer Elements	C. Bolometer Bridges
1. Thermistor	1. Temperature compensated, automatically balanced, ac and (or) dc biased
2. Barretter	2. Uncompensated, automatically balanced, ac and dc biased
3. Film	3. Uncompensated, automatically balanced, dc biased
B. Bolometer Mounts or Units	4. Uncompensated, manually balanced, dc biased
1. Single element	5. Analog read-out
2. Dual element	6. Digital read-out
3. Temperature lagged	7. Manual range switching
4. Temperature controlled	8. Automatic range switching
5. Temperature compensated	9. Programmable
6. Tunable	10. Remote analog read-out
7. Fixed tuned	11. Remote digital readout, specify language
8. Broadband — fixed tuned	
	D. Bolometer Power Meter: Appropriate Combinations of A, B, and C