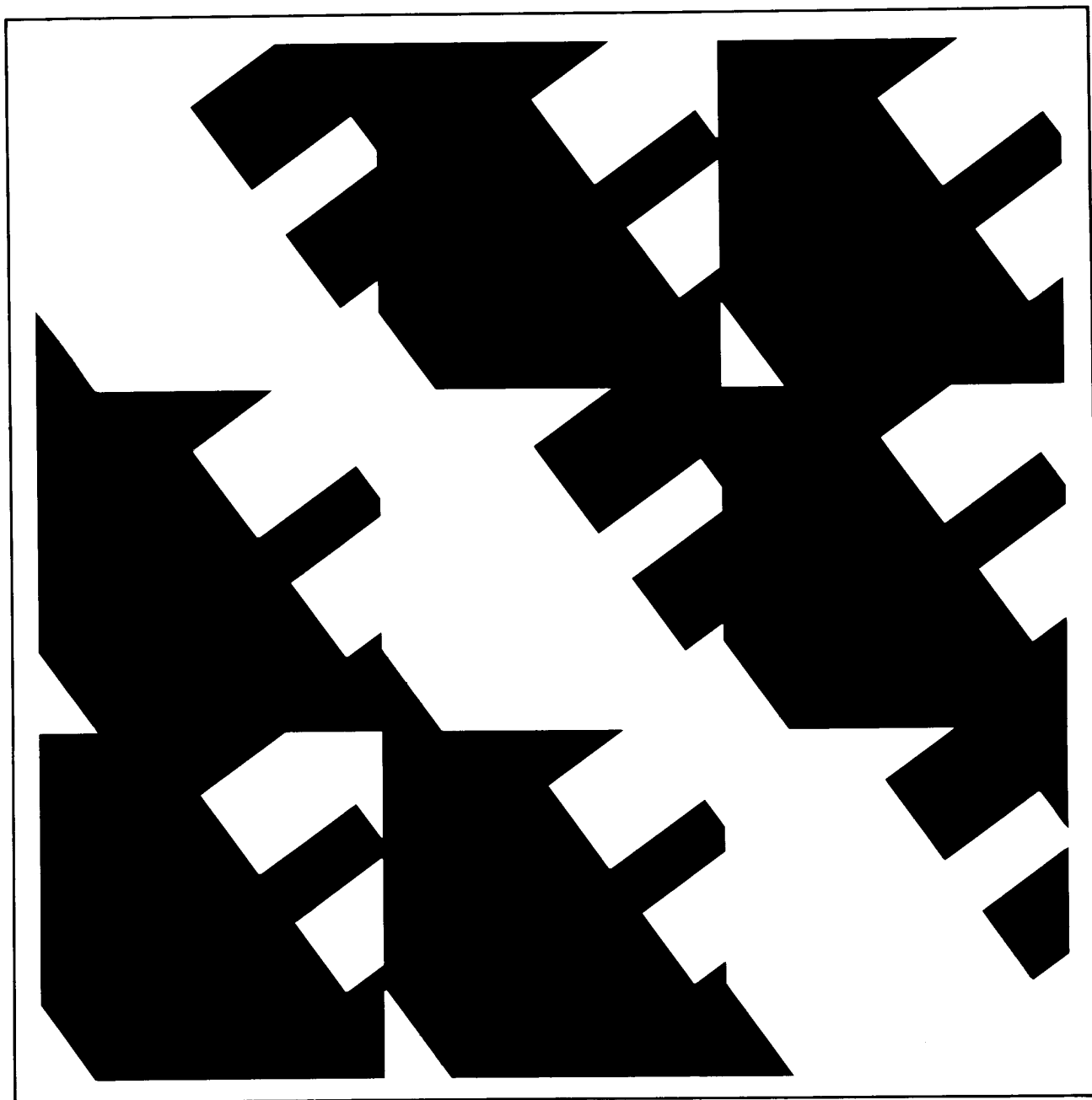


IEEE Standard on Pulse Measurement and Analysis by Objective Techniques



ANSI/IEEE Std 181-1977



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An American National Standard

**IEEE Standard on Pulse Measurement and
Analysis by Objective Techniques**

Sponsor
High Frequency Instruments and
Measurements Committee of the
IEEE Instrumentation and Measurements Group

Approved September 4, 1975
IEEE Standards Board

Approved August 29, 1979
American National Standards Institute

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Approved September 4, 1975

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Foreword

(This Foreword is not part of IEEE Std 181-1977, Pulse Measurement and Analysis by Objective Techniques.)

This standard supersedes IEEE Std 181-1955, Methods of Measurement of Pulse Quantities. It should be used in conjunction with IEEE Std 194-1977, Pulse Terms and Definitions.

The previous editions of the IEEE standards on pulses were published in 1951-1955, a period when pulse measuring instruments (principally, the cathode ray oscilloscope) were completing their evolution from qualitative indicators to quantitative instruments. These previous standards reflected this evolutionary stage in nomenclature, definitions, and methods of measurement which relied heavily on visual observation and subjective evaluation, or where more exact results were desired, on planimetric techniques. No review of the growth of pulse technology in the intervening years is needed here; by 1966 when the IEEE Subcommittee on Pulse Techniques was formed, the previous edition of this standard was obsolete.

The greatest challenge the Subcommittee faced was the development of a standard which would satisfy the needs of a wide range of users whose measurement practices ranged from the casual and inexact to the most careful and exact. Since a standard which covers exact work can, by degradation or omission, also cover inexact work, the Subcommittee developed a standard which satisfies the needs of the user and manufacturer of sophisticated pulse apparatus. In doing this the Subcommittee found it necessary to define or describe in a rigorous manner a number of well-established terms and techniques. Nonetheless, careful study of this standard will show that the techniques and practices of the more casual user have been preserved.

The Subcommittee also made the following decisions relative to the content of this standard:

(1) No frequency domain terms (e.g., bandwidth) would be used or defined. (2) No terms which link the time and frequency domains (e.g., pulse bandwidth) would be used or defined. (3) No acronyms or coined words would be used or defined.

The Subcommittee minimized the introduction of new concepts. At the first reading it may appear that there is a significant amount of new material; this is not the case. Section 2, Definitions, merely defines terms and techniques, some, perhaps, for the first time, more completely, or to a finer level of distinction. Section 3, Measurement of Pulse Characteristics, presents a model of the pulse measurement process. Sections 5 through 9 merely extend analysis of the single pulse waveform to encompass both simpler and more complex waveforms. Only in Section 4 is new material found as follows:

(1) Section 4.2, Waveform Epoch Determination. This material is not really new, but a new emphasis is put on the choice of data. (2) Sections 4.3.1, and 4.3.2 do present new techniques for the determination of base magnitude, top magnitude, and pulse amplitude.

The presentation of material in this standard, and within its sections, starts with the most general concepts and proceeds to the presentation of concepts which are more specific *in terms of concepts which have been presented previously*. This arrangement, while sacrificing alphabetical listing, yields a logical presentation of significant tutorial value.

Since its formation in 1966 the IEEE Subcommittee on Pulse Techniques has been broadly based. Collectively, its members represented or provided liaison with seven IEEE Societies or Groups (Circuits and Systems, Computer, Electron Devices, Engineering in Medicine and Biology, Instrumentation and Measurement, Magnetics, and Nuclear and Plasma Sciences), six technical associations (American Society for Testing and Materials, Electronic Industries Association, Instrument Society of America, National Conference of Standards Laboratories, Precision Measurement Association, and Scientific Apparatus Makers Association), and three Technical Committees of the International Electrotechnical Commission (Electron Tubes and Valves, Electronic Measuring Equipment, and Magnetic Materials and Components). Nine members of the Subcommittee were from six countries other than the U.S. (France, Germany, Hungary, Japan, the Netherlands and the United Kingdom).

Beginning in 1970 the liaison between the Subcommittee and Technical Committee 66, Electronic Measuring Equipment, of the International Electrotechnical Commission (IEC), became progressively closer and culminated in an informal mutual understanding that both groups would

attempt to provide their parent organizations with pulse standards which were the same. This goal was achieved; IEC Publication 469-2, 1974, Pulse Techniques and Apparatus, Part 2: Pulse Measurement and Analysis, General Considerations, is technically (and, otherwise, substantially) identical to this standard.

The IEEE Subcommittee on Pulse Techniques, which prepared this standard, had the following members:

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J.C. Hubbs, *Chairman* (1966-1971)

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- * Members of International Electrotechnical Commission Technical Committee 66: Electronic Measuring Equipment, Subcommittee 66A: Generators, Working Group I: Pulse Techniques and Apparatus.

This Standard was approved by the IEEE G-IM Technical Committee on High Frequency Instrumentation and Measurement which has the following members:

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