American National Standard

for Photography –

Root Mean Square (rms) Granularity of Film (Images on One Side Only) – Method for Measuring

ANSI/I3A IT2.40-2003

Approved American National Standard

ANSI

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Secretariat

International Imaging Industry Association, Inc. (I3A)

Approved January 22, 2003

American National Standards Institute, Inc.

American National Standard

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Published by

American National Standards Institute, Inc.
25 West 43rd Street, New York, NY 10036

Printed in the United States of America

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Foreword (This foreword is not part of American National Standard ANSI/I3A IT2.40-2003.)

This standard describes procedures for measuring the root-mean-square (rms) granularity of photographic films. Its purpose is to provide guidance in the making of accurate measurements and also to provide a common basis of measurement so that materials can be compared.

In principle, the measurement of rms-granularity is straightforward, but its determination with accuracy and precision is decidedly not a trivial matter. A large part of the text deals with procedures intended to reduce the influence of artifacts on the data obtained and to decrease variability.

Several allied kinds of granularity measurements have been excluded from this standard, although they are photographically important. These are:

1) rms-granularity of reflecting materials (papers);

2) rms-granularity of materials having emulsion coated on both sides of the support (some x-ray films);

3) measurement of the Wiener spectrum of photographic materials.

In all of these cases, it was the feeling of the committee that insufficient experience and data had been accumulated to justify preparation of standards covering them and that any attempt to do so would delay publication of this standard. Perhaps experience with this standard will be helpful in preparing similar ones covering these other cases.

Suggestions for improvement of this standard will be welcome. They should be sent to the International Imaging Industry Association, Inc. (I3A) , 550 Mamaroneck Avenue, Suite 307, Harrison, NY 10528-1615, e-mail: i3astds@i3a.org.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Image Evaluation. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the IT2 Committee had the following members:

Philip Wychorski, Chairman
Jack Holm, Vice-Chairman
Paul J. Kane, Secretary

Organization Represented	*Name of Representative*
International Imaging Industry Association, Inc. (I3A)	Philip Wychorski Phillip C. Bunch (Alt.) Paul J. Kane (Alt.) Thomas W. McKeehan (Alt.) Robert A. Uzenoff Robert D. Whittall
CGATS	Larry Steele
Photographic Society of America	Jack Holm Ira Current (Alt.)
US Dept. of Commerce – National Institute of Standards and Technology	Ted Early

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Root Mean Square (rms) Granularity of Film (Images on One Side Only) – Method for Measuring

1 Scope

This standard describes a method for the determination of the granularity of photographic films by scanning with a suitable microdensitometer. Continuous-tone black-and-white and color materials coated on a transmitting support may be measured by the procedures described. The concept of granularity applies to both reflecting and transmitting materials, and techniques that are basically similar to those described in this document can be used to evaluate reflection materials. However, this document is concerned only with samples coated on transmitting supports.

As noted in the Foreword, two other types of granularity measurements are not treated in this document. First, no specifications are given for measuring films that have emulsion coated on both sides of the support. Second, this document *does not* treat the measurement of the Wiener (or “power”) spectrum.

2 Normative references

2.1 Referenced International Standards

The following standards contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standard indicated below. Members of the IEC and ISO maintain registers of currently valid international Standards.

ISO 5-1:1984 (R1989), *Photography – Density measurements – Part 1: Terms, symbols and notations*

ISO 5-2:2001, *Photography – Density Measurements – Part 2: Geometric conditions for transmission density*

ISO 5-3:1995, *Photography – Density Measurements – Part 3: Spectral conditions*

2.2 Other referenced publications

[1] James, T.H., Ed. *The Theory of the Photographic Process*. 4th ed. New York: Macmillan; 1977: 618-628.

[2] Trabka, E.A. Relationship between RMS density and transmittance fluctuations of photographic film. *Journal of the Optical Society of America*. 59(5): 662-663; 1969 May.

[3] Zwick, D.M.; Brothers, D.L. RMS granularity: Determination of just-noticeable differences. *Photographic Science and Engineering.* 19(4): 235-238; 1975.

[4] Zweig, H.J. Autocorrelation and granularity: Part II – Results on flashed black and white emulsions. *Journal of the Optical Society of America*. 46(10): 812-820: 1956 October.

[5] Kaufman, M.; Seidman, A.H., Eds. *Handbook for Electronics Engineering Technicians*. New York: McGraw-Hill; 1976: Chapter 11.