

---

---

**Photography — Psychophysical  
experimental methods for estimating  
image quality —**

**Part 3:  
Quality ruler method**

*Photographie — Méthodes psychophysiques expérimentales pour  
estimer la qualité d'image —*

*Partie 3: Méthode «quality ruler»*



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS

© ISO 2005

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

Foreword.....	iv
Introduction .....	v
1 Scope .....	1
2 Normative references .....	1
3 Terms and definitions.....	1
4 Quality ruler experiments .....	5
4.1 General properties of quality rulers .....	5
4.2 Experimental conditions and reported results .....	5
4.3 Attributes varied in quality rulers .....	5
5 Hardcopy quality ruler implementation .....	6
5.1 Physical apparatus .....	6
5.2 Reference stimuli .....	7
6 Softcopy quality ruler implementation .....	8
6.1 Physical apparatus .....	8
6.2 Reference stimuli .....	8
6.3 Controlling software .....	8
7 Generation of quality ruler stimuli .....	9
7.1 General requirements .....	9
7.2 Modulation transfer functions (MTFs) .....	9
7.3 Scene-dependent ruler calibration.....	11
8 Standard quality scale (SQS) determinations.....	12
8.1 Properties of the SQS .....	12
8.2 Experimental requirements .....	12
Annex A (informative) Sample instructions for a hardcopy quality ruler experiment.....	13
Annex B (informative) Sample instructions for a softcopy quality ruler experiment.....	15
Annex C (informative) Sample code of a binary search routine for the softcopy quality ruler.....	17
Annex D (informative) Calibration of the standard quality scale (SQS) and its reference stimuli.....	18
Annex E (informative) Example of results from quality ruler experiments .....	20
Bibliography .....	24

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

ISO 20462-3 was prepared by Technical Committee ISO/TC 42, *Photography*.

ISO 20462 consists of the following parts, under the general title *Photography — Psychophysical experimental methods for estimating image quality*:

— *Part 1: Overview of psychophysical elements*

— *Part 2: Triplet comparison method*

— *Part 3: Quality ruler method*

## Introduction

There are many circumstances under which it is desirable to quantify image quality in a standardized fashion that facilitates interpretation of results within a given experiment and/or comparison of results between different experiments. Such information can be of value in assessing the performance of different capture or display devices, image processing algorithms, etc. under various conditions. However, the choice of the best psychometric method for a particular application may be difficult to make, and interpretation of the rating scales produced by the numerical analyses is frequently ambiguous. Furthermore, none of the commonly used rating techniques provides an efficient mechanism for calibration of the results against a standardised numerical scale or associated physical references, which is desirable when results of different experiments are to be compared or integrated.

The three parts of ISO 20462 address the need for documented means of determining image quality in a calibrated fashion. Part 1 provides an overview of practical psychophysics and aids in identifying the better choice between the two alternative approaches described in Part 2 (triplet comparison method<sup>[1][2]</sup>) and Part 3 (quality ruler method<sup>[3]</sup>). These two techniques are complementary and together are sufficient to span a wide range of practical applications. Parts 2 and 3 document both specific experimental methods and associated data reduction techniques. It is the intent of these methods to produce results that are not merely directional in nature, but are expressed in terms of relative or fixed scales that are calibrated in terms of just noticeable differences (JNDs), so that the significance of experimentally measured stimulus differences is readily ascertained.

The quality ruler method described in this part of ISO 20462 is particularly suitable for measuring quality differences exceeding one JND. The ratings given by an observer can be converted to JND values in real time, rather than having to wait until the entire experimental data set has been collected and analysed. Furthermore, with suitable reference stimuli, the quality ruler method permits the results to be reported using the standard quality scale (SQS), a fixed numerical scale that:

- a) is anchored against physical standards;
- b) has one unit corresponding to one JND; and
- c) has a zero point corresponding to an image having little identifiable information content.

Reflection prints calibrated against the absolute SQS, which are referred to as standard reference stimuli (SRS), will be available on the I3A website. This part of ISO 20462 also describes how users can conveniently generate their own quality ruler images with correct relative calibrations and, if desired, calibrate them absolutely against the SRS.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of US Patent Numbers 6,639,999 and 6,658,139 concerning the quality ruler given in Clauses 4 to 6.

ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Patent inquiries may be addressed to:

General Council and Senior Vice President  
Eastman Kodak Company  
345 State Street  
Rochester, NY 14650  
USA

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.

This document is a preview generated by EVS

# Photography — Psychophysical experimental methods for estimating image quality —

## Part 3: Quality ruler method

### 1 Scope

This part of ISO 20462 specifies

- a) the nature of a quality ruler;
- b) hardcopy and softcopy implementations of quality rulers;
- c) how quality rulers may be generated or obtained; and
- d) the standard quality scale (SQS), a fixed numerical scale that may be measured using quality rulers.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3664, *Viewing conditions — Graphic technology and photography*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **artefactual attribute**

attribute of image quality that, when evident in an image, nearly always leads to a loss of overall image quality

EXAMPLE Examples of artefactual attributes include noise and aliasing.

NOTE The commonly used terms *defect* and *impairment* are similar in meaning.

#### 3.2

##### **attribute**

aspect, dimension, or component of overall image quality

cf. **artefactual attribute** (3.1) and **preferential attribute** (3.10)

EXAMPLE Examples of image quality attributes include image structure properties such as sharpness and noise; colour and tone reproduction properties such as contrast, colour balance, and relative colourfulness; and digital artefacts such as aliasing, contouring, and compression defects.