

*ANSI Z136.4 – 2010*

# American National Standard

*American National Standard  
Recommended Practice for  
Laser Safety Measurements  
for Hazard Evaluation*

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**Laser Institute  
of America**  
*Laser Applications and Safety*



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**Z136.4 – 2010**  
Revision of  
ANSI Z136.4-2005

**American National Standard  
Recommended Practice for  
Laser Safety Measurements  
for Hazard Evaluation**

**Secretariat  
Laser Institute of America**

**Approved April 22, 2010  
American National Standards Institute, Inc.**

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Published by

**Laser Institute of America  
13501 Ingenuity Drive, Suite 128  
Orlando, FL 32826**

ISBN: #0-912035-78-1

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Printed in the United States of America.

**Foreword** (This introduction is not a normative part of ANSI Z136.4-2010, *American National Standard Recommended Practice for Laser Safety Measurements for Hazard Evaluation.*)

In 1968, the American National Standards Institute (ANSI) approved the initiation of the Safe Use of Lasers Standards Project under the sponsorship of the Telephone Group.

Prior to 1985, Z136 standards were developed by ANSI Committee Z136 and submitted for approval and issuance as ANSI Z136 standards. Since 1985, Z136 standards are developed by the ANSI Accredited Standards Committee (ASC) Z136 for Safe Use of Lasers. A copy of the procedures for development of these standards can be obtained from the secretariat, Laser Institute of America, 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826 or viewed at [www.z136.org](http://www.z136.org).

The present scope of ASC Z136 is to protect against hazards associated with the use of lasers and optically radiating diodes.

ASC Z136 is responsible for the development and maintenance of this standard. In addition to the consensus body, ASC Z136 is composed of standards subcommittees (SSC) and technical subcommittees (TSC) involved in Z136 standards development and an editorial working group (EWG). At the time of this printing, the following standards and technical subcommittees were active:

SSC-1	Safe Use of Lasers (parent document)
SSC-2	Safe Use of Lasers and LEDs in Telecommunications Applications
SSC-3	Safe Use of Lasers in Health Care
SSC-4	Measurements and Instrumentation
SSC-5	Safe Use of Lasers in Educational Institutions
SSC-6	Safe Use of Lasers Outdoors
SSC-7	Eyewear and Protective Barriers
SSC-8	Safe Use of Lasers in Research, Development, and Testing
SSC-9	Safe Use of Lasers in Manufacturing Environments
SSC-10	Safe Use of Lasers in Entertainment, Displays, and Exhibitions
TSC-1	Biological Effects and Medical Surveillance
TSC-2	Hazard Evaluation and Classification
TSC-4	Control Measures and Training
TSC-5	Non-Beam Hazards
TSC-7	Analysis and Applications
EWG	Editorial Working Group

The six standards currently issued are:

ANSI Z136.1-2007, *American National Standard for Safe Use of Lasers* (replaces ANSI Z136.1-2000)

ANSI Z136.3-2005, *American National Standard for Safe Use of Lasers in Health Care Facilities* (replaces ANSI Z136.3-1996)

ANSI Z136.4-2010, *American National Standard Recommended Practice for Laser Safety Measurements for Hazard Evaluation* (replaces ANSI Z136.4-2005)

ANSI Z136.5-2009, *American National Standard for Safe Use of Lasers in Educational Institutions* (replaces ANSI Z136.5-2000)

ANSI Z136.6-2005, *American National Standard for Safe Use of Lasers Outdoors* (replaces ANSI Z136.6-2000)

ANSI Z136.7-2008, *American National Standard for Testing and Labeling of Laser Protective Equipment* (first edition)

This American National Standard Recommended Practice provides guidance for optical measurements associated with laser safety requirements. The information provided in this recommended practice is intended to assist users who are entrusted with the responsibility of conducting laser hazard evaluations to ensure that appropriate control measures are implemented. Laser safety requirements and the rationale for them are specified in ANSI Z136.1 *American National Standard for Safe Use of Lasers*. The procedures and methodologies described in this recommended practice are based on requirements previously established in ANSI Z136.1. As the name implies, this recommended practice contains recommendations that will lead to the desired end result. On many occasions, there is more than one measurement approach to achieve the end result, and the recommended measurement techniques in this recommended practice should be viewed as plausible practical options, and not necessarily as the exclusive techniques to perform a given task.

This recommended practice has been published as part of the ANSI Z136 series of laser safety standards. The basic document is the ANSI Z136.1, *American National Standard for Safe Use of Lasers*. In general, this recommended practice may be used as a supplement to ANSI Z136.1 when additional details on laser safety measurements are desired.

This standard is expected to be periodically revised as new information and experience in the use of lasers is gained. Future revisions may have modified methodology, and use of the most current document is highly recommended.

While there is considerable compatibility among existing laser safety standards, some requirements differ among state, federal, and international standards and regulations. These differences may have an effect on the particulars of the applicable control measures.

Occasionally questions may arise regarding the meaning or intent of portions of this standard as it relates to specific applications. When the need for an interpretation is brought to the attention of the secretariat, the secretariat will initiate action to prepare an appropriate response. Since ANSI Z136 standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, the secretariat is not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration. Requests for interpretations and suggestions for improvements of the standard are welcome. They should be sent to ASC Z136 Secretariat, Laser Institute of America, 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826.

This standard was processed and approved for submittal to ANSI by ASC Z136. Committee approval of the standard does not necessarily imply that all members voted for its approval.

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Z136 standards and recommended practices are developed through a consensus standards development process approved by the American National Standards Institute. The process brings together volunteers representing varied viewpoints and interests to achieve consensus on laser safety related issues. As secretariat to ASC Z136, the Laser Institute of America (LIA) administers the process and provides financial and clerical support to the committee.

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## Contents

SECTION	PAGE
1. General.....	1
1.1 Scope.....	1
1.2 Application.....	1
2. Definitions.....	2
3. Detector Properties.....	10
3.1 Active Area .....	10
3.2 Responsivity.....	11
3.3 Noise Equivalent Power.....	11
3.4 Normalized Detectivity.....	11
3.5 Spectral Responsivity.....	11
3.6 Spatial Uniformity .....	12
3.7 Response Linearity.....	13
3.8 Power/Energy Range .....	13
3.9 Damage Threshold .....	14
3.10 Detector Response Time .....	14
3.11 Pulse Repetition Effects.....	14
3.12 Background or Stray Radiation.....	15
3.13 Environmental Sensitivity.....	15
3.14 Field of View and Alignment .....	15
3.15 Radiometric Instrument Detector Systems .....	15
3.16 Calibration and Measurement Uncertainty.....	16
4. Laser Classification and Hazard Evaluation .....	16
4.1 Background .....	16
4.2 Laser Classification Schemes .....	21
4.3 Laser Hazard Evaluation and Hazard Class Determination.....	23
5. Laser Measurements .....	23
5.1 Wavelength (Spectral Content).....	23
5.2 Limiting and Measurement Apertures .....	23
5.3 Power or Energy .....	24
5.4 Irradiance and Radiant Exposure.....	24
5.5 Apparent Visual Angle (Angular Subtense $\alpha$ ).....	25
5.6 Beam Characteristics .....	28
5.7 Beam Waist.....	30
5.8 Beam Divergence.....	31
5.9 Pulse Characteristics .....	33
5.10 M-Squared ( $M^2$ ) .....	34

SECTION	PAGE
Tables	
Table 1. Limiting Apertures (Irradiance and Radiant Exposure) and Limiting Cone Angles $\gamma$ (Radiance and Integrated Radiance) for AEL Determination and Hazard Evaluation.....	18
Table 2. Measurement Apertures for Laser Classification .....	19
Figures	
Figure 1. Spectral Responsivities of Silicon and Germanium Photodiodes .....	12
Figure 2. Detector Spatial Uniformity .....	13
Figure 3. Illustration for Determination of Apparent Visual Angle .....	26
Figure 4. Diffuse Laser Reflection Viewed at Some Angle from Normal Incidence.....	27
Figure 5. Two-Point Beam Diameter Measurement.....	32
Figure 6. Arrangement for Long Focal Length Lens and Small Aperture.....	33
Appendix A	
Acronyms, Abbreviations, and Variable Symbols.....	35
A1. Acronyms and Abbreviations.....	35
A2. Variable Symbols.....	36
A3. Photobiological Quantities.....	37
Table	
Table A1. Useful Standardized International CIE Radiometric Units 1, 2.....	38
Appendix B	
Detectors .....	40
B1. Thermal Detectors .....	40
B2. Quantum Detectors.....	41
Appendix C	
Detector Specifications .....	43
C1. Detectors and Detector Capability Ranges for Continuous Laser Input Conditions .....	43
C2. Detectors and Detector Capability Ranges for Pulsed Laser Input Conditions .....	44
Appendix D	
Laser Hazard Evaluation and Classification .....	45
D1. General.....	45
D2. Wavelength or Wavelengths .....	45
D3. Pulse Properties (Temporal Profile).....	45
D4. Exposure Duration ( $T$ ) .....	45



SECTION	PAGE
D5. Beam Diameter ( $D_L$ ) and Divergence ( $\phi$ ) .....	46
D6. Angular Subtense (Angular Source Size or Apparent Visual Angle) .....	46
D7. Total Power or Energy .....	46
D8. MPE .....	47
D9. Limiting Aperture ( $D_f$ ) .....	47
D10. Measurement Aperture .....	48
D11. Laser Hazard Class .....	48
D12. Hazard Evaluation .....	49
Figure	
Figure D-1. Pulsed Laser Properties .....	49
Appendix E	
Examples .....	51
E1. Detector Selection Example 1 .....	51
E2. Detector Selection Example 2 .....	55
E3. Selecting Measurement Apertures .....	58
E4. Energy Measurement .....	59
E5. Classification .....	59
E6. Beam Diameter, Beam Profile, Irradiance Distribution .....	64
E6a. Gaussian Beam Profiles (Near Field) .....	64
E6b. Non-Gaussian Beam Profiles (Near Field) .....	69
E7. Diode Laser Illuminator .....	71
E8. Q-Switched Nd:YAG Laser .....	74
E9. Beam Divergence .....	77
E10. Extended Sources .....	80
E11. Uncertainty Analysis .....	85
E12. Beam Splitters .....	93
Tables	
Table E1-1. Laser Beam Parameters for Example 1 .....	51
Table E1-2. Detector Specifications for Example 1 .....	52
Table E2-1. Laser Beam Parameters for Example 2 .....	55
Table E2-2. Detector Specifications for Example 2 .....	56
Table E3-1. Laser Parameters for Example 3 .....	58
Table E5-1. Laser Output Parameters for Example 5 .....	60
Table E6-1. Beam Profile Analysis Results .....	65
Table E6-2. Data for Example 6 .....	69
Table E7-1. Data for Example 7 .....	73
Table E8-1. Far Field Beam Profile Analysis Results .....	74
Table E9-1. Laser Beam Parameters for Example 9 .....	78
Table E10-1. Laser Beam Parameters .....	80

SECTION	PAGE
Table E10-2. Visual Angle Measurements .....	83
Table E11-1. Standard Uncertainties and Combined Uncertainty for the Pulse Energy Measurement Example .....	87
Table E11-2. Standard Uncertainties and Combined Uncertainty for Correction Factor $C_A$ for the MPE Example.....	89
Table E11-3. Standard Uncertainties and Combined Uncertainty for Single Pulse $MPE_p$ for the MPE Example .....	90
Table E11-4. Standard Uncertainties and Combined Uncertainty for Effective Number of Pulses $n_{eff}$ for the MPE Example.....	90
Table E11-5. Standard Uncertainties and Combined Uncertainty for the MPE Example .....	91
Table E11-6. Standard Uncertainties and Combined Uncertainty for the NOHD Example .....	92
Table E11-7. Standard Uncertainties and Combined Uncertainty for the OD Example .....	93
 Figures	
Figure E6-1. Near Field Beam Profiles 1 and 2.....	66
Figure E6-2. Profile 1 Near Field Beam Cross-Section.....	67
Figure E6-3. Profile 2 Near Field Beam Cross-Section.....	68
Figure E6-4. Beam Cross-Section for Example 6.....	69
Figure E7-1. Far Field Profile – Diode Laser Illuminator .....	72
Figure E8-1. Cross Sectional Far-Field Beam Profiles with Corresponding Analysis Results – Profile 1 .....	75
Figure E8-2. Cross Sectional Far-Field Beam Profiles with Corresponding Analysis Results – Profile 2 .....	76
Figure E8-3. Far-Field Beam Profiles 1 and 2.....	77
Figure E10-1. Extended Source Ray Diagrams - Laser System Design.....	82
Figure E10-2. Visual Angle Measurement Setup .....	83
Figure E10-3. Extended Source Size Measurements and Computations.....	84
Figure E10-4. Laser Beam Irradiance and MPE Comparison .....	85
Figure E12-1. Basic Beamsplitter-based Measurement System .....	93
 Appendix F	
References.....	97
 Appendix G	
Measurement Pitfalls .....	100
Measurement Errors and Pitfalls.....	100
 Index .....	 104

# **American National Standard Recommended Practice for Laser Safety Measurements for Hazard Evaluation**

## **1. General**

### **1.1 Scope.**

This document provides adequate, practical guidance for necessary measurement procedures used for classification and hazard evaluation of lasers. This document is intended to provide guidance for manufacturers, laser safety officers (LSOs), and trained laser users.

### **1.2 Application.**

This document provides practical guidance for the measurement of those parameters necessary for the classification and evaluation of optical radiation hazards associated with lasers. Evaluation consists of comparing measured exposure levels with the appropriate maximum permissible exposure (MPE) values such as those found in the American National Standards Institute (ANSI) Z136.1 *American National Standard for Safe Use of Lasers*. The MPE is based on the ability of the laser beam or its reflection or scattering to cause biological damage to the eye or skin. Classification consists of comparing accessible radiation levels with accessible emission limits (AELs), such as those in the Federal Laser Product Performance Standard (FLPPS) 21 CFR 1040.10 and 1040.11, or the International Electrotechnical Commission (IEC) 60825-1 laser safety standard.

Generally, measurements for hazard evaluation are required only when the manufacturer's information is not available, when the laser or laser system has not been classified, or when suspected malfunctions or alterations to a system may have changed its classification or the potential hazard. For laser manufacturers and developers of lasers in the research environment, etc., measurements are especially important.

If there is a potential for exposure to laser radiation within the nominal hazard zone (NHZ) requiring the use of personal protective devices, then measurements should be attempted only by personnel trained or experienced in laser technology and radiometry. Routine survey measurements of lasers or laser systems are neither required nor advisable when the laser classifications are known, except as noted above.

This document addresses only the measurement of those parameters associated with the laser output beam. Consult ANSI Z136.1 for information pertaining to non-beam hazards associated with lasers and laser systems. Lasers or laser systems certified for a specific class by a manufacturer in accordance with the FLPPS or IEC 60825-1 standard may be considered as fulfilling all classification requirements of this recommended practice. In cases where the laser or laser system classification is not provided or where the class may change because of system alteration or the addition or deletion of engineering control measures, the LSO should ensure that