ISO 11421:2025-11 (E)

Optics and photonics - Uncertainty of optical transfer function (OTF) measurement

Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms, definitions and symbols **1**
3.1 Terms and definitions 1
3.2 Symbols 2

4 Sources of uncertainty in measuring equipment **3**
4.1 General 3
4.2 Geometry of optical bench system 4
4.2.1 General 4
4.2.2 Finite object and image distance 4
4.2.3 Infinite object distance and finite image distance 5
4.2.4 Infinite object and image distance 6
4.2.5 Suppression of image distance errors by refocusing 6
4.2.6 Mounting of test piece 6
4.3 Azimuth changing 7
4.3.1 General 7
4.3.2 Finite object and image distance 7
4.3.3 Infinite object distance and finite image distance 7
4.3.4 Infinite object and image distance 7
4.3.5 Suppression of image distance errors by refocusing 7
4.4 Alignment (orientation) of TTU and image analyser 7
4.5 Correction factors 8
4.5.1 General 8
4.5.2 Slit width errors 9
4.5.3 Correction for MTF of incoherently coupled relay lenses 9
4.5.4 Spatial frequency correction for field angle 9
4.5.5 Off-axis magnification errors due to image distortion using grating objects 10
4.6 Image distance error 10
4.7 Spatial frequency errors 11
4.8 Residual aberrations in relay optics 11
4.9 Spectral characteristics 11
4.10 Extent of test target and/or scan and/or camera detector 11
4.11 Angular response characteristics of image analyser 12
4.12 Polar luminance/radiation characteristics of object generator 12
4.13 Signal and data processing 12
4.14 Stray radiation 12
4.15 Coherent radiation 12
4.16 Baseline error 12
4.17 Linearity of camera detector 13

5 Methods of assessing measurement errors **13**
5.1 General 13
5.2 Geometry of optical bench system 13
5.2.1 Straightness of slideways 13
5.2.2 Parallelism of surfaces and/or perpendicularity to reference axes 16
5.2.3 Errors of rotation angles 17
5.3 Collimation error (departure from infinite object distance) 18

5.4 Image distance setting 20
5.5 Spectral characteristics 21
5.6 Extent of target and/or scan and/or camera detector 22
5.7 Signal and data processing 22
5.8 Polar response to image analyser 22
6 Calculation of overall uncertainty of a measurement 23
7 Specifying a general equipment uncertainty 24
7.1 General 24
7.2 Nominal uncertainty value (NUV) 24
7.3 Standard-lens measurements (SLM) 25
7.4 Audit-lens measurements (ALM) 25
7.5 Slit aperture test (SAT) 26
8 Routine performance evaluation 26
Annex A (normative) **Uncertainty of PTF measurement 27**
Annex B (informative) **Determination of rate of change of MTF with various parameters 29**
Annex C (informative) **Example calculation of NUV 32**
Bibliography 44