

# ISO 11421:2025-11 (E)

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

<b>Contents</b>		<b>Page</b>
<b>Foreword</b>		<b>v</b>
<b>Introduction</b>		<b>vi</b>
<b>1 Scope</b>		<b>1</b>
<b>2 Normative references</b>		<b>1</b>
<b>3 Terms, definitions and symbols</b>		<b>1</b>
3.1	Terms and definitions	1
3.2	Symbols	2
<b>4 Sources of uncertainty in measuring equipment</b>		<b>3</b>
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
<b>5 Methods of assessing measurement errors</b>		<b>13</b>
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
<b>6</b>	<b>Calculation of overall uncertainty of a measurement .....</b>	<b>23</b>
<b>7</b>	<b>Specifying a general equipment uncertainty .....</b>	<b>24</b>
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
<b>8</b>	<b>Routine performance evaluation .....</b>	<b>26</b>
<b>Annex A (normative) Uncertainty of PTF measurement.....</b>		<b>27</b>
<b>Annex B (informative) Determination of rate of change of MTF with various parameters .....</b>		<b>29</b>
<b>Annex C (informative) Example calculation of NUV.....</b>		<b>32</b>
<b>Bibliography.....</b>		<b>44</b>