# ISO 12233:2023-02 (E)

## Photography - Electronic still picture imaging - Resolution and spatial frequency responses

## Contents

Page


**Foreword** ..... **v**

**Introduction** ..... **vi**

**1 Scope** ..... **1**

**2 Normative references** ..... **1**

**3 Terms and definitions** ..... **1**

**4 Test conditions** ..... **5**
4.1 Test chart illumination ..... 5
4.2 Camera framing and lens focal length setting ..... 6
4.3 Camera focusing ..... 6
4.4 Camera settings ..... 6
4.5 White balance ..... 7
4.6 Luminance and colour measurements ..... 7
4.7 Gamma correction ..... 7

**5 Visual resolution measurement** ..... **7**
5.1 General ..... 7
5.2 Test chart ..... 8
5.2.1 General ..... 8
5.2.2 Material ..... 8
5.2.3 Size ..... 8
5.2.4 Test patterns ..... 8
5.2.5 Test pattern modulation ..... 8
5.2.6 Positional tolerance ..... 8
5.3 Rules of judgement for visual observation ..... 9
5.3.1 Rules of judgement ..... 9
5.3.2 An example of a correct visual judgement ..... 9

**6 Edge-based spatial frequency response (e-SFR)** ..... **10**
6.1 General ..... 10
6.2 Methodology ..... 13

**7 Sinewave-based spatial frequency response (s-SFR) measurement** ..... **13**

**8 Presentation of results** ..... **14**
8.1 General ..... 14
8.2 Resolution ..... 15
8.2.1 General ..... 15
8.2.2 Basic presentation ..... 15
8.2.3 Representative presentation ..... 15
8.3 Spatial frequency response (SFR) ..... 15
8.3.1 General ..... 15
8.3.2 Spatial frequency response ..... 15
8.3.3 Report of resolution value derived from the s-SFR ..... 16

**Annex A** (informative) **CIPA resolution chart** ..... **18**

**Annex B** (informative) **Visual resolution measurement software** ..... **24**

**Annex C** (informative) **Edge SFR test chart** ..... **30**

**Annex D** (informative) **Edge spatial frequency response (e-SFR) algorithm** ..... **32**

**Annex E** (normative) **Sine wave star test chart** ..... **38**

**Annex F** (normative) **Sine wave spatial frequency response (s-SFR) analysis algorithm** ..... **41**
**Annex G** (informative) **Colour-filtered resolution measurements** ..... **46**
**Annex H** (informative) **Units and summary metrics** ..... **48**
**Annex I** (informative) **Original test chart defined in ISO 12233:2000** ..... **52**
**Annex J** (informative) **Non-uniform illumination compensation for some applications** ..... **56**
**Annex K** (informative) **Derivation of correction functions** ..... **62**
**Annex L** (informative) **Acutance calculation** ..... **66**
**Annex M** (informative) **Matlab function for computing e-SFR** ..... **69**
**Bibliography** ..... **75**