Technical Specification

ISO/TS 20490

Measuring autofocus repeatability of sharpness and latency

Mesure de la répétabilité de la netteté et de la latence de l'autofocus

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 42, *Photography*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is focusing on measuring the repeatability of the AF latency and the sharpness of the captured images. ISO 15781 specifies how to measure and report the shooting time lag, shutter release time lag, shooting rate and start-up time lag for digital still cameras. This document focuses on combining the autofocus latency with measured sharpness of the captured photos, making it more comprehensive test procedure for evaluating autofocus systems.

This document widens the options for usable test charts from high contrast digitally created charts to natural images and to other test charts and even 3D scenes, challenging the autofocus systems. It also allows measurements to be carried out in variable lighting conditions, and in presence of handshake, challenging the AF system further.

ISO 15781 is mainly focusing on traditional single autofocus solutions actuated by half pressing physical shutter button, widely used with SLR cameras. However, this document can be applied to continuous AF systems, commonly used in mobile camera devices, as well as to single autofocus systems.

This document provides procedures and methods to measure and report the autofocus (AF) repeatability of sharpness and latency of a digital still camera. The data gathered is useful when comparing camera devices with sufficiently similar autofocus solutions and it helps with further investigations into a camera's autofocus repeatability performance.

The terminology is defined within this document along with describing the test charts, the setup, the methods, the performance metrics and analysis methodology to assess and report on the autofocus repeatability of a camera device. This document covers the test setups, the process, what pictures to capture and the metrics to calculate.

A great camera system should be capable to deliver repeatably sharp images within acceptable and repeatable latency, making the characterization of the AF system very important.

Measuring autofocus repeatability of sharpness and latency

1 Scope

This document is focused on measuring the autofocus (AF) repeatability of sharpness and latency, meaning camera system's capability to produce sharp images within certain time frame. The scope of document is limited to testing autofocus sharpness and latency repeatability with stationary charts only as testing with moving charts is not covered.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 15781, *Photography — Digital still cameras — Measuring shooting time lag, shutter release time lag, shooting rate, and start-up time lag*

3 Terms and definitions and abbreviated terms

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
autoexposure
AE
system to automatically adjust the exposure parameters such as gain, exposure time and aperture

3.2
autofocus
AF
focusing system which can automatically control the optical system in a camera to bring a subject into focus

3.3
continuous autofocus
AF-C
autofocus system continuously keeping subject in focus

3.4
field of view
FoV
extent of the observable world that is seen (solid angle through optics to sensor) at any given moment by an imaging system i.e. camera

3.5
depth of field
DoF
distance between the nearest and the furthest objects that are in acceptably sharp focus in an image captured with a camera

3.6
spatial frequency response
SFR
relative amplitude response of an imaging system as a function of input spatial frequency

3.7
single autofocus
AF-S
focusing system which focuses on the selected target once, often activated by pressing camera button halfway down, and keeps the selected focus until focused again

4 Test description

4.1 General

The measurement shall be carried out using output images from a digital still camera with which the test is conducted.

The following measurement conditions should be used as nominal conditions when measuring the autofocus repeatability of a digital still camera. If it is not possible to achieve these conditions, the actual capture conditions shall be listed along with the reported results.

Target of the study is to measure if the devices in question are capable to focus and produce sharp images within a certain timeframe which is based on measurements of human reaction time in photographic situation per Annex C.

4.2 Test device settings

Cameras are to be tested in default out of the box settings. If testing is done with something else than out of the box settings, those settings should be mentioned in the report.

4.3 Environmental conditions

The measurements shall be carried out in the following environment unless otherwise stated:

— temperature: 23 °C ± 3 °C.

4.4 Apparatus and hardware

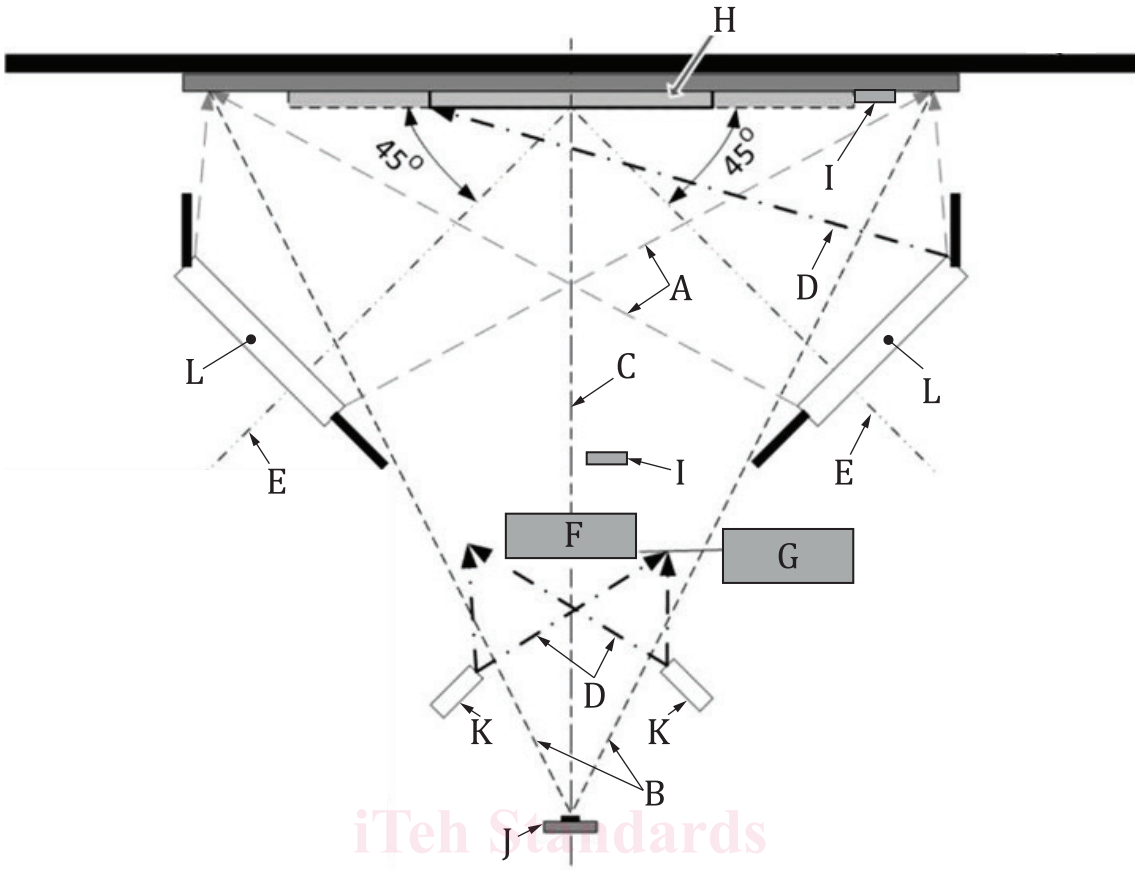
The test setup consists of several components: close distance and far distance test charts, illumination setup for both charts, actuated holder to move the close distance chart, timing LED panel, and computer system to control the timing of the image capture and peripheral devices like the close distance chart actuation and LED timing panel or timer.

In this document the test setups and recommendations are assuming usage of reflective test charts. In special situations also transmissive test chart can be used, but particular care needs to be applied when using transmissive charts. For example, the recommended lux conditions should be in-line with the used panel brightness. The light flux from the chart shall be diffused and shall not include any specular component.

The camera holder should allow the centre of the camera optical axis to be aligned along a line perpendicular to the chart in such a way that the optical axis is perpendicular for both close distance and far distance charts.

The close distance chart actuation stage shall allow the chart to be removed or inserted into the field of view of the camera within 0,1 s or less, as required in ISO 15781.

Figure 1 shows the top view of the example test setup. The close distance and far distance charts are aligned orthogonally to the camera. Baffles can be used to block light traveling directly from the light source to the camera lens and minimize light being cast outside the 18 % grey area.



Key

A line A: Light rays from the edges of the lamps are shown intersection of which the 18 % gray background edges. ― ― ―

B line B: Camera HFoV ----

C line C: Camera optical axes ― - ― - ― - ―

D line D: Light rays from close distance chart illuminators ― · ― · ― · ―

E line E: Light intensity pattern from the lamp is pointing parallel to the direction of this line. The line intersects the target at 45 degrees - ·· - ·· - ·· -

F close distance chart

G close distance chart actuator stage

H far distance chart

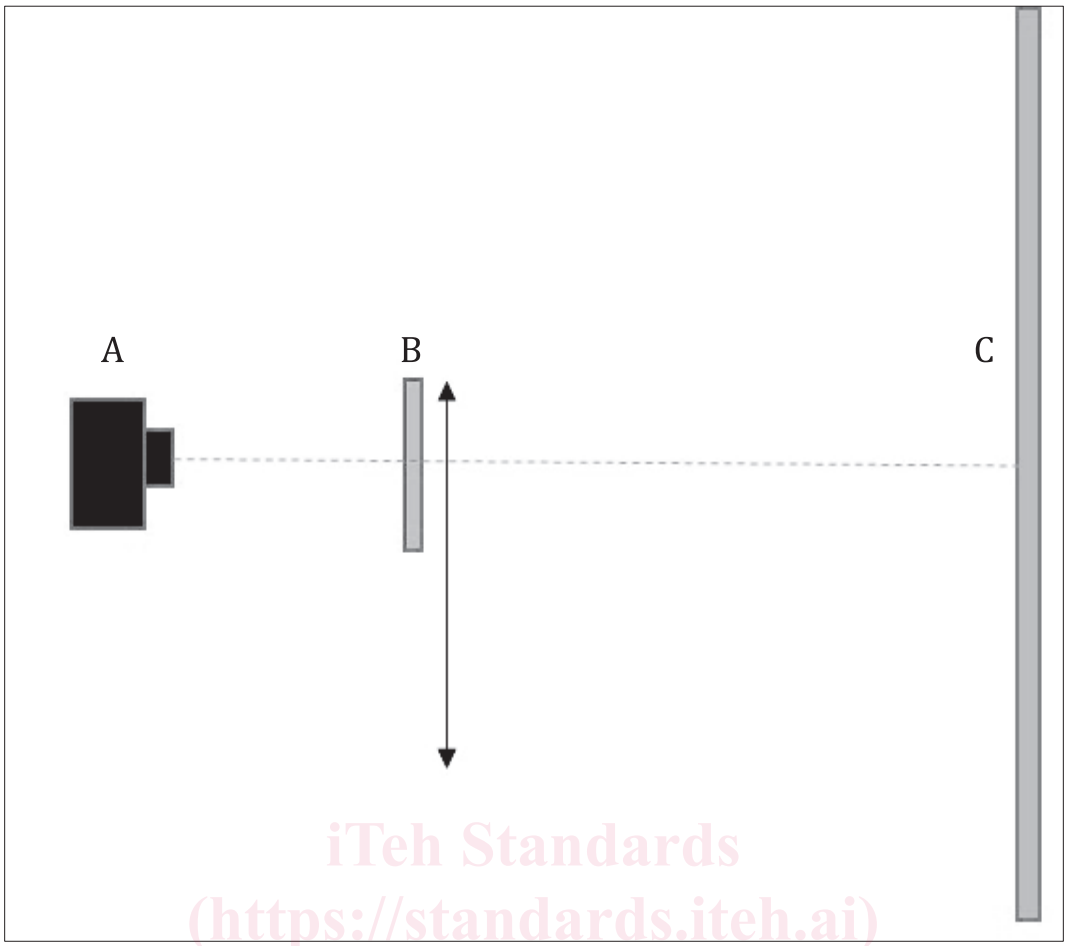
I LED timer

J camera under test

K close distance chart illuminants

L far distance chart illuminants

Figure 1 — Top view of example test setup



Key

A camera under test

B close distance chart

C far distance chart

Figure 2 — Side View of Test Setup. The close distance chart is moved in and out of the field of view

4.5 Test distance

For test distances, the following chart distances are recommended.

The close distance chart distance is set to 10 times the lens 35 mm equivalent focal length. The far distance chart distance is set to 7 times the close distance chart distance. If the 10 times focal length close distance cannot be achieved, then the closest possible focusing distance should be used.

For example, if the closest focusing distance for camera with 24 mm lens is 24 cm, the far distance chart distance is 168 cm.

If recommended distances cannot be achieved, the actual used distances shall be clearly stated in the results.

4.6 Test charts

4.6.1 General

Test chart content can have a significant impact for autofocus repeatability and latency. Because of this, it can be very useful to test the autofocus with different kinds of test charts. Using the algorithm provided in Annex B, tests can be conducted with multiple types of test chart contents including natural or artificial