

TECHNICAL REPORT



**Equipment for general lighting purposes – EMC immunity requirements –
Part 1: An objective light flickermeter and voltage fluctuation immunity test
method**



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method**

INTERNATIONAL
ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EQUIPMENT FOR GENERAL LIGHTING PURPOSES – EMC IMMUNITY REQUIREMENTS–

Part 1: An objective light flickermeter and voltage fluctuation immunity test method

FOREWORD

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IEC TR 61547-1, which is a Technical Report, has been prepared by technical committee 34: Lamps and related equipment.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the title of Part 1 has been changed to reflect the more general application of the objective flickermeter;
- b) the specific voltage fluctuation immunity test method has been extended for lighting equipment rated for 120 V AC and 230 V AC, 50 Hz and 60 Hz.

The text of this Technical Report is based on the following documents:

| | |
|------------|------------------|
| Draft TR | Report on voting |
| 34/387/DTR | 34/398A/RVDTR |

Full information on the voting for the approval of this Technical Report can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61547 series, published under the general title *Equipment for general lighting purposes – EMC immunity requirements*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

The fast rate at which solid state light (SSL) sources can change their intensity is one of the main drivers behind the revolution in the lighting world and applications of lighting. Linked to the fast rate of the intensity change is a direct transfer of the modulation of the driving current, both intended and unintended, to a modulation of the luminous output. This light modulation can give rise to changes in the perception of the environment. While in some very specific entertainment, scientific or industrial applications, a change of perception due to light modulation is desired, for most everyday applications and activities the change is detrimental and undesired. The general term used for these changes in the perception of the environment is “temporal light artefacts” (TLAs) and these can have a large influence on the judgment of the light quality. Moreover, the visible modulation of light can lead to a decrease in performance, increased fatigue as well as acute health problems like epileptic seizures and migraine episodes [18][19]¹.

Different terms exist to describe the different types of TLAs that may be perceived by humans. The term ‘flicker’ refers to light variation that may be directly perceived by an observer. ‘Stroboscopic effect’ is an effect which may become visible for an observer when a moving or rotating object is illuminated (CIE TN 006:2016[22]).

Possible causes for light modulation of lighting equipment that may give rise to flicker or stroboscopic effect are:

- AC supply combined with light source technology and its driver topology;
- dimming technology of externally applied dimmers or internal light level regulators;
- mains voltage fluctuations caused by electrical apparatus connected to the mains (conducted electromagnetic disturbances) or intentionally applied for mains-signalling purposes.

Lighting products that show unacceptable flicker or stroboscopic effect are considered as poor quality lighting.

This document provides an objective light flickermeter and a method for testing the immunity of lighting equipment against mains voltage fluctuations caused by electrical apparatus connected to the mains at levels that are allowed through IEC 61000-3-3.

Flicker perception, as well as IEC 61000-3-3 and IEC 61000-4-15, the associated standards for voltage fluctuations and flickermeter, are based on the 60 W incandescent lamp. As a result of the phasing out of incandescent lamps and the widespread introduction of alternative lighting equipment technologies, a new reference lamp was considered. It has been demonstrated that new lighting technologies are in general less but sometimes also more sensitive to supply voltage fluctuations than the current 60 W incandescent lamp. A CIGRE working group has assessed the impact of new lighting technologies on the existing flicker standards [17]. For the moment, the present flicker sensitivity curve of IEC 61000-3-3 remains as the reference. However, because of the increased diversity of sensitivity of lighting equipment to voltage fluctuations, there is a future need for a voltage-fluctuation immunity test specifically for lighting equipment. In this way, the full EMC approach (Figure 1) is introduced for flicker, i.e. with a view to limiting voltage fluctuations caused by equipment connected to the grid, and in addition to establishing a minimum level of flicker immunity of lighting equipment against these voltage fluctuations.

This document will allow the lighting industry to gain experience in flicker immunity test methods. Results of actual tests will be reported in a separate IEC Technical Report. Based on the experience gained on this immunity test method, the adoption of a similar test to be applied for IEC 61547, the immunity standard for lighting equipment, will be considered.

¹ Numbers in square brackets refer to the Bibliography.