

# TECHNICAL REPORT



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## Equipment for general lighting purposes – EMC immunity requirements – Part 1: Objective light flickermeter and voltage fluctuation immunity test method



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## Equipment for general lighting purposes – EMC immunity requirements – Part 1: Objective light flickermeter and voltage fluctuation immunity test method

INTERNATIONAL  
ELECTROTECHNICAL  
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## CONTENTS

FOREWORD .....	5
INTRODUCTION .....	7
1 Scope .....	8
2 Normative references .....	8
3 Terms, definitions, abbreviated terms and symbols .....	9
3.1 Terms and definitions .....	9
3.2 Abbreviated terms .....	10
3.3 Symbols .....	11
4 General .....	11
5 Light flickermeter .....	13
6 Voltage fluctuation disturbance signal .....	13
6.1 General .....	13
6.2 Mains signal parameters .....	14
6.3 Disturbance signal parameters and test levels .....	15
7 Test setup and equipment .....	16
7.1 General .....	16
7.2 Test voltage .....	17
7.3 Optical test environment .....	17
7.4 Light sensor and amplifier .....	18
7.5 Signals to be measured .....	18
7.6 Signal processing .....	18
7.6.1 Anti-aliasing filter .....	18
7.6.2 Sampling frequency .....	19
7.6.3 Signal resolution .....	19
8 Verification procedure .....	21
8.1 General .....	21
8.2 Light flickermeter .....	21
8.3 Mains voltage parameters without modulation .....	22
8.3.1 Nominal voltage level .....	22
8.3.2 Mains frequency .....	22
8.4 Voltage fluctuation level .....	22
8.4.1 General .....	22
8.4.2 Option 1: measure the actual modulation frequencies and voltage levels .....	22
8.4.3 Option 2: measure $P_{st}^V$ values using a flickermeter .....	22
8.5 Light sensor and amplifier .....	23
8.6 Test environment .....	23
8.7 Light flicker noise .....	23
9 Test procedure .....	24
9.1 General .....	24
9.2 Measuring the intrinsic flicker performance .....	25
9.3 Testing the flicker immunity against voltage fluctuations .....	26
9.4 Dimmer compatibility testing .....	26
9.5 Controlgear testing .....	27
10 Conditions during testing .....	27
11 Evaluation of the test result .....	28

12	Test report.....	28
Annex A	(informative) Specification of the light flickermeter .....	29
A.1	Voltage flickermeter modifications.....	29
A.2	Specification of the light flickermeter.....	30
A.2.1	General .....	30
A.2.2	Block a: illuminance adapter .....	30
A.2.3	Block b: weighting filters .....	30
A.2.4	Block c: squaring multiplier, sliding mean filter and scaling .....	31
A.2.5	Block d: statistical analysis .....	31
A.3	Verification of the light flickermeter .....	32
A.4	Example of $P_{st}^{LM}$ implementation in MATLAB® .....	33
Annex B	(informative) Uncertainty considerations .....	34
B.1	General.....	34
B.2	General symbols .....	34
B.3	Measurand.....	34
B.4	Influence quantities.....	34
B.5	Uncertainty budget.....	36
Annex C	(informative) Examples of test results of lighting equipment.....	38
C.1	Test without voltage fluctuations ( $P_{st}^{LM}$ ) .....	38
C.2	Test with (intentional) voltage fluctuations $P_{st}^{LM}(I)$ .....	38
C.3	Test under dimming conditions.....	42
Annex D	(informative) Guidance for $P_{st}^{LM}$ testing based on test type.....	44
Bibliography	.....	45
Figure 1	– Full EMC approach for mains voltage fluctuations .....	12
Figure 2	– Illustration of the mains test signal including a rectangular modulated voltage fluctuation (see Equation (1)).....	14
Figure 3	– Block diagram voltage-fluctuation immunity test .....	17
Figure 4	– Example of a recorded mains voltage fluctuation and illuminance signal of a 60 W incandescent lamp .....	21
Figure 5	– Measuring $P_{st}^{LM}$ .....	26
Figure 6	– Measuring $P_{st}^{LM}(I)$ .....	26
Figure 7	– Dimmer compatibility testing .....	26
Figure 8	– Controlgear testing.....	27
Figure A.1	–Structure of the IEC 61000-4-15 flickermeter that uses voltage as input.....	29
Figure A.2	– Structure of the light flickermeter based on a modified voltage flickermeter .....	29
Figure A.3	– Flickermeter response to different waveshapes.....	33
Figure C.1	– Graphical $P_{st}^{LM}(I)$ results for three EUTs with rectangular modulation at five frequencies ( $P_{st}^V = 1$ ).....	39
Figure C.2	– EUT1: recorded signals (no mains voltage modulation).....	40
Figure C.3	– EUT1: recorded signals (with modulation).....	41

Figure C.4 – EUT2: relative illuminance – Mains voltage modulation  $d = 0,407\%$  at 13,5 Hz ( $P_{st}^V = 1$ ) ..... 42

Figure C.5 – EUT3: relative illuminance – Mains voltage modulation  $d = 0,407\%$  at 13,5 Hz ( $P_{st}^V = 1$ ) ..... 42

Figure C.6 – Graphical  $P_{st}^{LM}(C)$  results for four EUTs under dimming conditions..... 43

  

Table 1 – Voltage fluctuations – Test specification of voltage fluctuations applied at input AC mains 120/230 V and 50/60 Hz ..... 16

Table 2 – Guidance for  $P_{st}^{LM}$  testing ..... 25

Table A.1 – Test specification of illuminance fluctuations for lightmeter classifier ..... 32

Table B.1 – Influence quantities and their recommended tolerances ..... 35

Table B.2 – Uncertainty budget of the voltage fluctuation immunity test ..... 37

Table C.1 – Numerical results  $P_{st}^{LM}$  calculations for three EUTs without voltage modulation ..... 38

Table C.2 – Numerical results  $P_{st}^{LM}(I)$  calculations for three EUTs with voltage modulation ..... 38

Table C.3 – Numerical results  $P_{st}^{LM}(C)$  calculations for four EUTs under dimming conditions ..... 43

Table D.1 – Guidance for  $P_{st}^{LM}$  testing based on test conditions ..... 44

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**EQUIPMENT FOR GENERAL LIGHTING PURPOSES –  
EMC IMMUNITY REQUIREMENTS –****Part 1: Objective light flickermeter and voltage fluctuation  
immunity test method**

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

This third edition cancels and replaces the second edition published in 2017. This edition constitutes a technical revision.

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

- a) the scope of this document has been clarified to make a distinction between flicker testing without voltage fluctuations to measure the intrinsic performance of lighting equipment and flicker testing in which a specific set of voltage fluctuations are applied in order to measure the immunity of the lighting equipment to voltage fluctuations present on the mains;
- b) the test procedure for flicker testing has been clarified.

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

Draft TR	Report on voting
34/668/DTR	34/701/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,
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- amended.

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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. These changes in the perception of the environment are called "temporal light artefacts" (TLAs) and 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 health problems like epileptic seizures and migraine episodes [17][18]<sup>1</sup>.

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 [26]).

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;
- light regulation technology of externally applied light level regulators 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 are considered as poor-quality lighting.

This document provides a description of an objective light flickermeter and a method for measuring the intrinsic flicker of lighting equipment as well as 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 the 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 [16]. 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.

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<sup>1</sup> Numbers in square brackets refer to the Bibliography.