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TECHNICAL REPORT

colour inside

Assessment of lighting equipment related to human exposure to electromagnetic fields – Part 1: Results of the EMF measurement campaign from the VDE Test and Certification Institute and ZVEI, the German Electrical and Electronic Manufacturers' Association

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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FOREWORD

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IEC/TR 62493-1, which is a technical report, has been prepared by IEC technical committee 34: Lamps and related equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
34/178/DTR	34/183/RVC

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

A list of all the parts in the IEC 62493 series, published under the general title *Assessment of lighting equipment related to human exposure to electromagnetic fields* can be found on the IEC website.

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

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- withdrawn,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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

In 2011 it was decided by VDE and ZVEI to start a measurement campaign for testing a broad range of different types of luminaires with different lamp technologies against the new EMF (Electromagnetic Fields) standard IEC 62493:2009 (identical to EN 62493:2010-02). The goal was to get an overview on the EMF measurement results dependent on different lamp technologies used in current luminaires on the market. For this measurement campaign only the test procedure with the so called Van der Hoofden head in the frequency range from 20 kHz to 10 MHz was used.

The goal of this campaign is to identify construction details of lighting equipment which are critical for the EMF measurements.

NOTE The VDE Testing and Certification Institute is a part of the VDE Association for Electrical, Electronic & Information Technologies. The VDE Testing and Certification Institute is accredited on a national and international level for the area of testing and certification of electrotechnical equipment, components and systems. ZVEI is the German Industry Association for the Electrical Industry.

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1 Scope

This part of the IEC 62493 series presents an overview on EMF measurement results dependent on different lamp technologies used in current luminaires. For the measurement only the test procedure with the so called Van der Hoofden head in the frequency range from 20 kHz to 10 MHz was used.

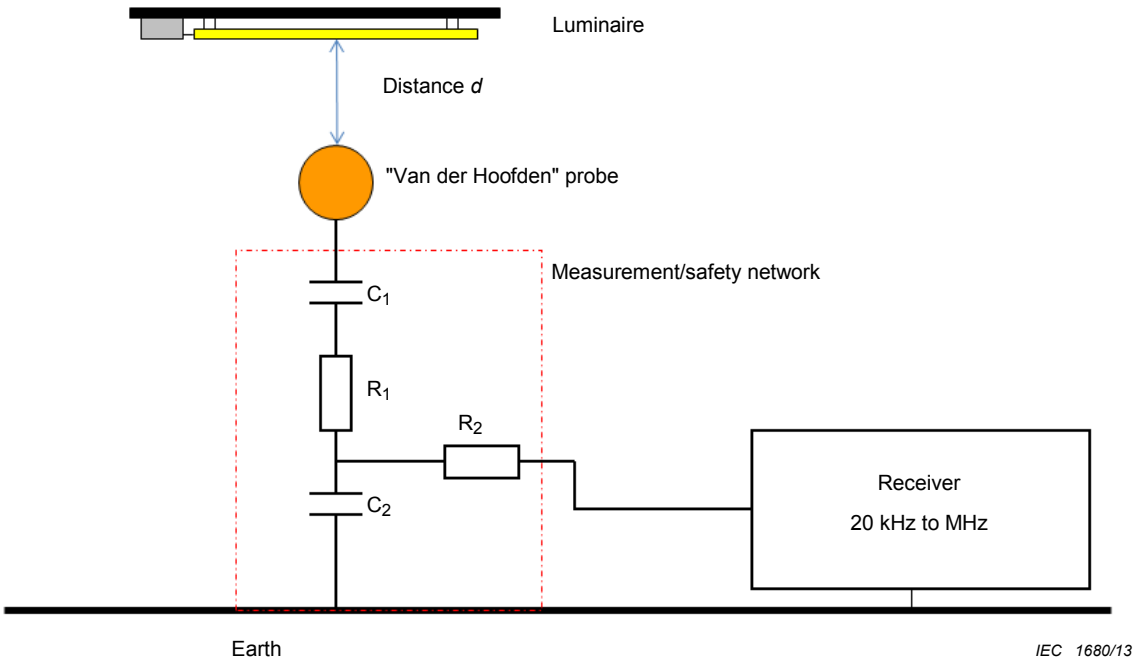
2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62493:2009, *Assessment of lighting equipment related to human exposure to electromagnetic fields*

3 Test procedure

The testing of luminaires has been performed according to the requirements of IEC 62493:2009. The luminaires have been placed over the test head at the distance d as required by the standard. Figure 1 shows the set-up in principal.



Example
C_1 = 470 pF
C_2 = 10 nF
R_1 = 470 Ω
R_2 = 150 Ω

Figure 1 – Measurement set-up according IEC 62493

The result of each measurement over the frequency range from 20 kHz to 10 MHz is a single value *F* which is calculated using all measurement values in the whole frequency range. For this calculation the measured voltages, weighted with the limit at each frequency, are summed up over the whole frequency range. The limit for *F* is a value of 0,85.

The noise level, caused by the thermal noise floor in the receiver is always present even if the luminaire under test is not energized. The value *F* of this noise level in our case is 0,03. The noise level is dependent on the overall noise figure of the receiver and the attenuator setting of the receiver. If the receiver is set to higher attenuations then the noise level is higher and therefore the noise level result *F* is higher also.

4 Presentation of results

4.1 General

In the following subclauses the results of the measurement campaign are presented as tables showing the influence of different parameters of the tested luminaires.

4.2 Frequency distribution of the measured values

The frequency distribution figures show the number of luminaires for which measurement results (Factor *F*) are within a result interval. It is recognized that there is a clustering within some intervals.

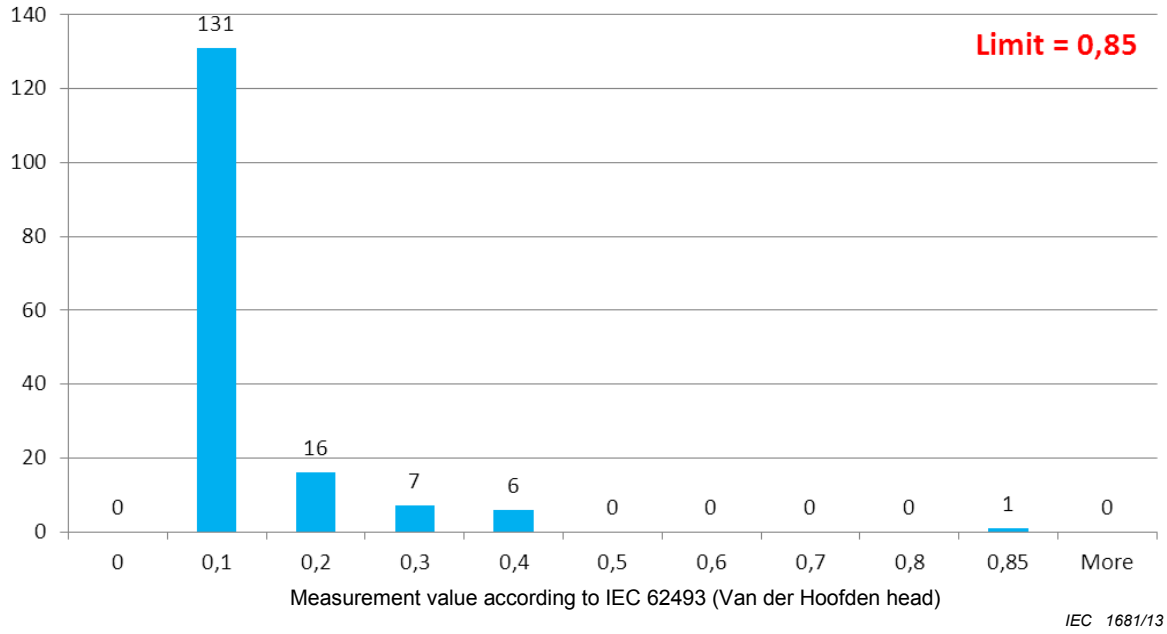


Figure 2 – Frequency distribution of the measured values of the luminaires (absolute number of luminaires)

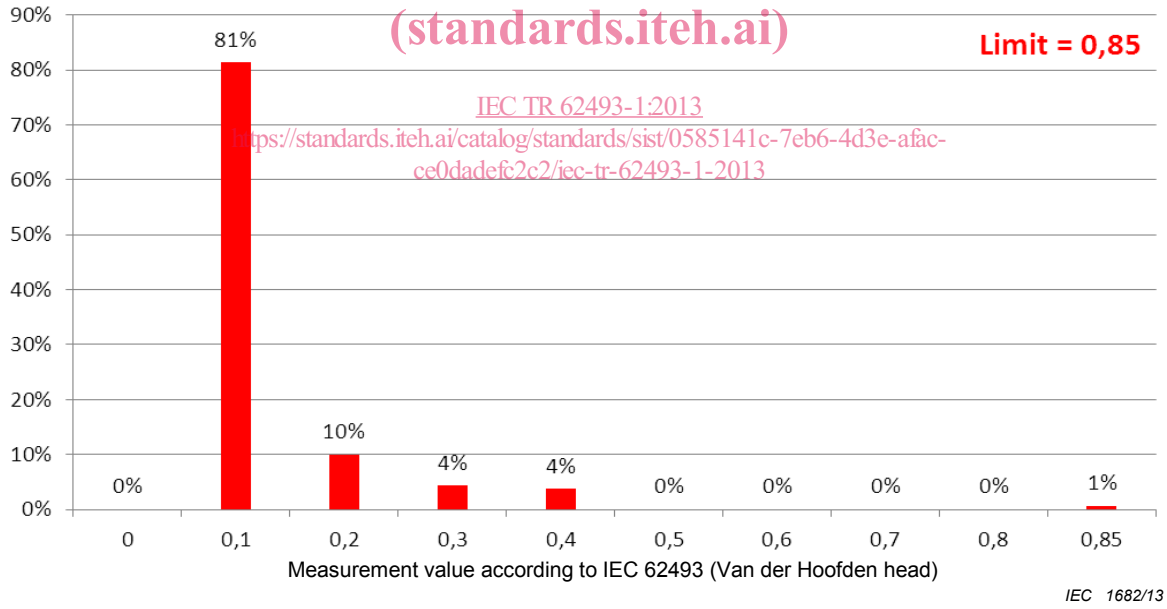


Figure 3 – Frequency distribution of the measured values *F* in the interval from 0 to 0,85 expressed as percentage values.

It is clearly visible in Figure 2 and Figure 3 that a number of 131 luminaires (81 %) out of a total of 161 (= 100 %) generated measurement values between 0 and 0,1. Only 16 luminaires (10 %) are in the range from 0,1 to 0,2. None of the measured luminaires are in the range between 0,4 and 0,85. Only one luminaire has shown a result which is near to the limit of 0,85. It will be explained later why this special luminaire generated such a high result *F*.

A significant majority (99 %) of all measured values are below half (0,425) of the limit (0,85).

In the following Figure 4 the interval from 0 to 0,1 which consists of 131 measured luminaires (80 %) is shown more finely divided. In this diagram the first bar (131 results) of Figure 2 above is shown more finely divided.

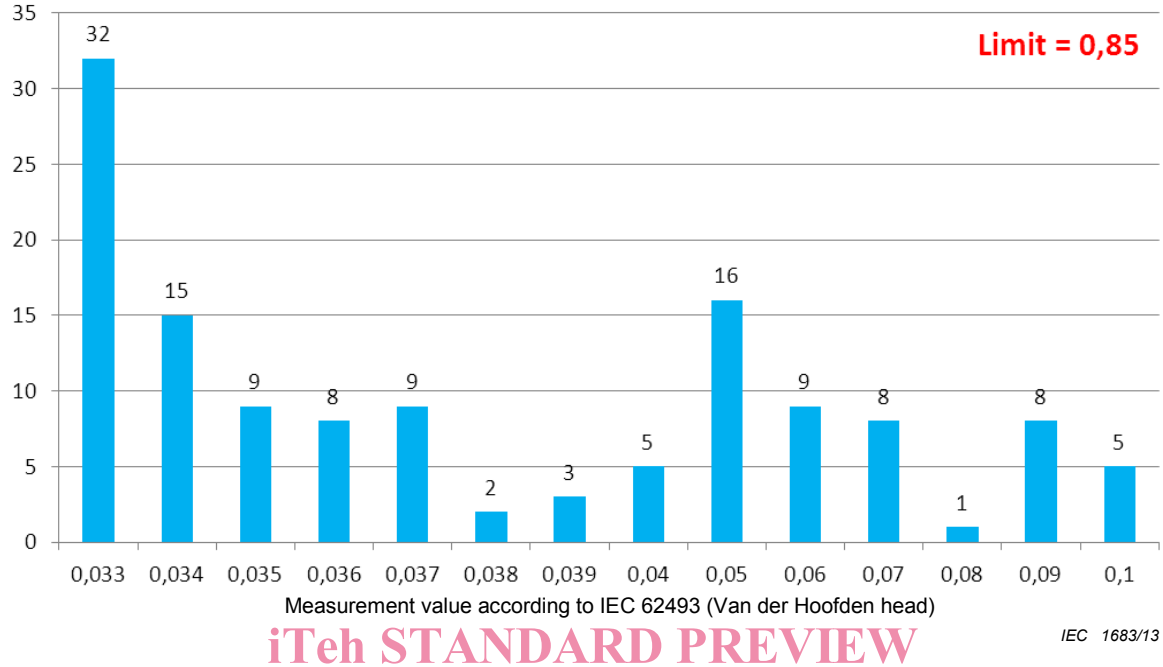


Figure 4 – Frequency distribution of the measured values *F* in the interval from 0 to 0,1.

The largest number of samples (32 pieces) corresponds to the noise level of approximately 0,03. So the 32 samples out of 161 samples in total have emissions which are below 0,035 % of the applicable limit (0,85).

4.3 Explanation for the high measurement results of one single luminaire

The highest value measured during the campaign was a factor *F* = 0,84. This factor was measured with a luminaire equipped with a 58 W T8 lamp which was covered by a thin, transparent plastic protection. Only if the luminaire is supplied with 230 V AC, the high value of 0,84 was measured. Supplied with 230 V DC the measured value was only *F* = 0,13. The reason for this behavior is the frequency modulation of the operating frequency of the electronic control gear due to the 50 Hz (100 Hz) supply voltage modulation. This leads to a kind of “smearing” of the spectrum, clearly visible in Figure 5 compared to the spectrum in DC mode in Figure 6 which is a stable line spectrum.