Brüel & Kjær application notes

Luminaire Distribution Mapping

by *Eric Thalheimer*

Up to now, all illuminance distribution pattern has required manual measurements and calculations in order to make drawings of contour maps by hand. Now Brüel & Kjær has simplified the procedure. A prototype fixture can be accurately measured, analyzed, contour-mapped, and documented with the data and results stored on disk within a few minutes.

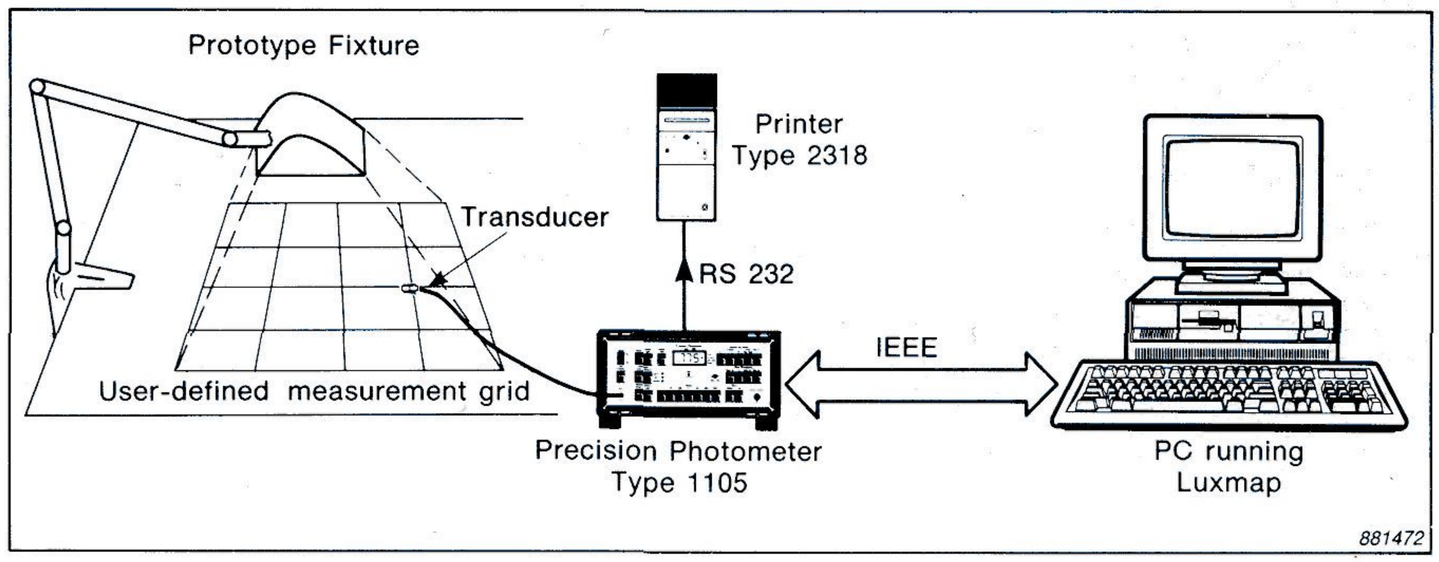

Fig. 1. The Brüel & Kjær luminaire evaluation system

Introduction

Brüel & Kjær introduces a fixture-design evaluation system utilizing high accuracy photometric measurements and dedicated software. This system consists of Brüel & Kjær's Precision Photometer Type 1105 used in conjunction with Brüel & Kjær's LUXMAP software and a Hewlett Packard personal computer (see Fig. 1). Now the illuminance distribution obtained with prototype fixtures, lamps, or luminaires can be accurately measured and automatically mapped into a contour display and a three-dimensional display (see Fig. 2 and 4). The prototype can then be adjusted or redesigned to achieve the optimum desired beam control. Theoretical light levels can be keyed into the LUXMAP program in order to display modified theoretical contour maps. As a result, LUXMAP can be used as a luminaire prototype evaluation and documentation system. The photometric data can be stored on disk and recalled for later inspection and comparison.

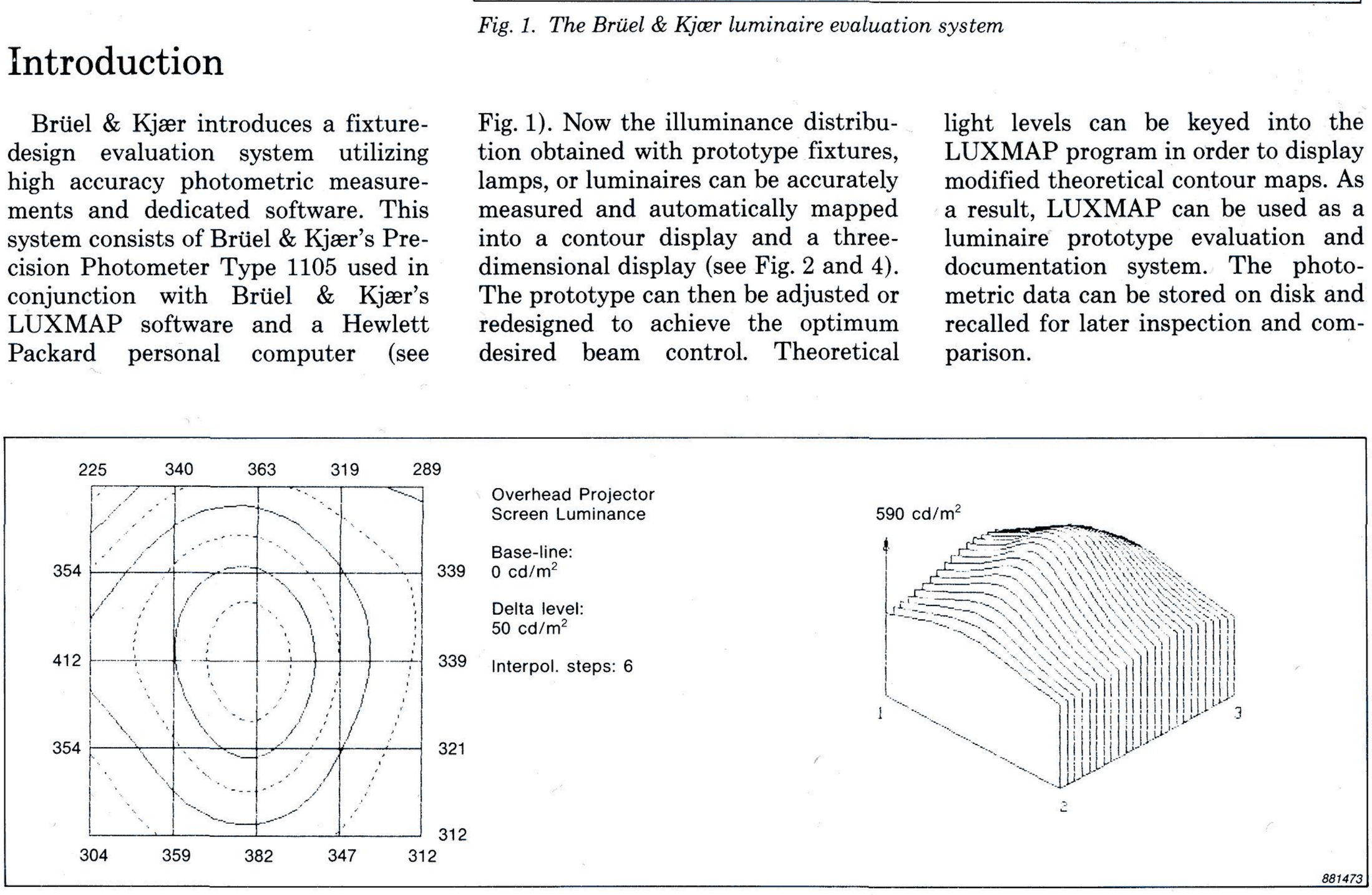

Fig. 2. Sample output from LUXMAP: luminance distribution on an overhead projector screen

The heart of this system is Brüel & Kjær's Precision Photometer Type 1105. When used with the Illuminance Transducer Type 8600, it forms a compact and portable stand-alone instrument for measuring illuminance in the field and in the laboratory. The measurement range is from 0,001 units to 200 kilo units with manual or automatic range setting and three choices of averaging time as well as peak measurement capabilities. User-defined transducer sensitivity allows the Type 1105 to display any desired units such as lux or foot-candles; various luminance adaptors can be used to display results in candela/m^2 or foot-lamberts. The Brüel & Kjær light Transducers are designed for an unequalled match to the CIE photopic vision curve with an error in match (f_1) specified at $<2\%$ (see Fig. 3). This high-quality photopic match ensures accurate measurements of highly concentrated narrow-bandwidth light sources as well as full-spectrum lighting.

The real power of the Type 1105 is found in its digital interfaces. An IEEE 488 parallel interface and an RS 232 equivalent serial interface are included as standard. The serial interface is useful for downloading results

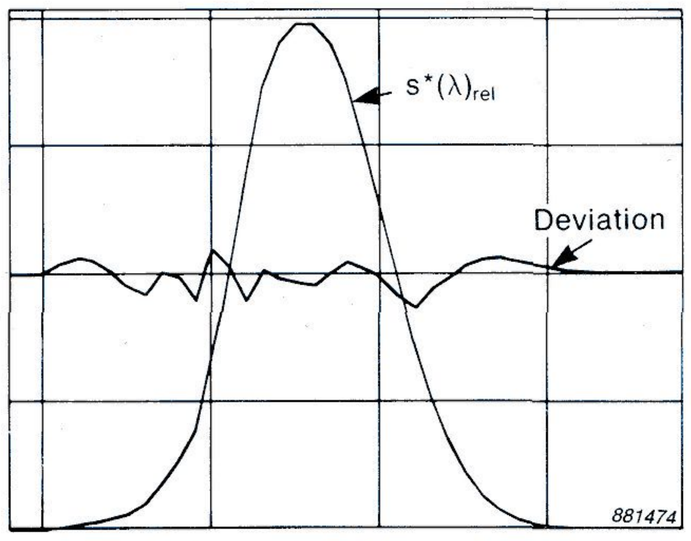

Fig. 3. Typical calibration chart for the Illuminance Transducer Type 8600

to a portable digital printer such as the Brüel & Kjær Type 2318, while the IEEE interface is used to communicate to computers. Data can be sent to the computer and in turn the computer can completely control the Type 1105. This powerful interface permits the automated collection of illuminance data to be downloaded to a host computer, which can subsequently interpolate and generate contour maps and three-dimensional displays. The LUXMAP software is currently available for HP computers.

Several of these automated systems have already been sold, most notably to Philips Lighting Company of Lynn, Massachusetts, for the development and evaluation of fluorescent tubes.

The Type 1105/LUXMAP system is not limited to luminaire evaluation. A multitude of lighting study applications can be accurately measured and documented as a result of the portability of the Type 1105 and the user-defined LUXMAP grid size. For example, illuminance contour maps of room lighting or office table-tops can be generated, and the lighting distribution and uniformity of street lighting can be mapped. Another example is mapping the brightness or contrast levels of video display terminals (VDTs) by the use of a luminance adaptor. The variety of applications for this system is limited only by the imagination of the user.

Relevant Standards

[1] DIN 5035, part 6, 1983 (indoor lighting)
[2] Publication CIE 30/2, 1986 (Road lighting)
[3] Publication CIE 34, 1977 (Lanterns)

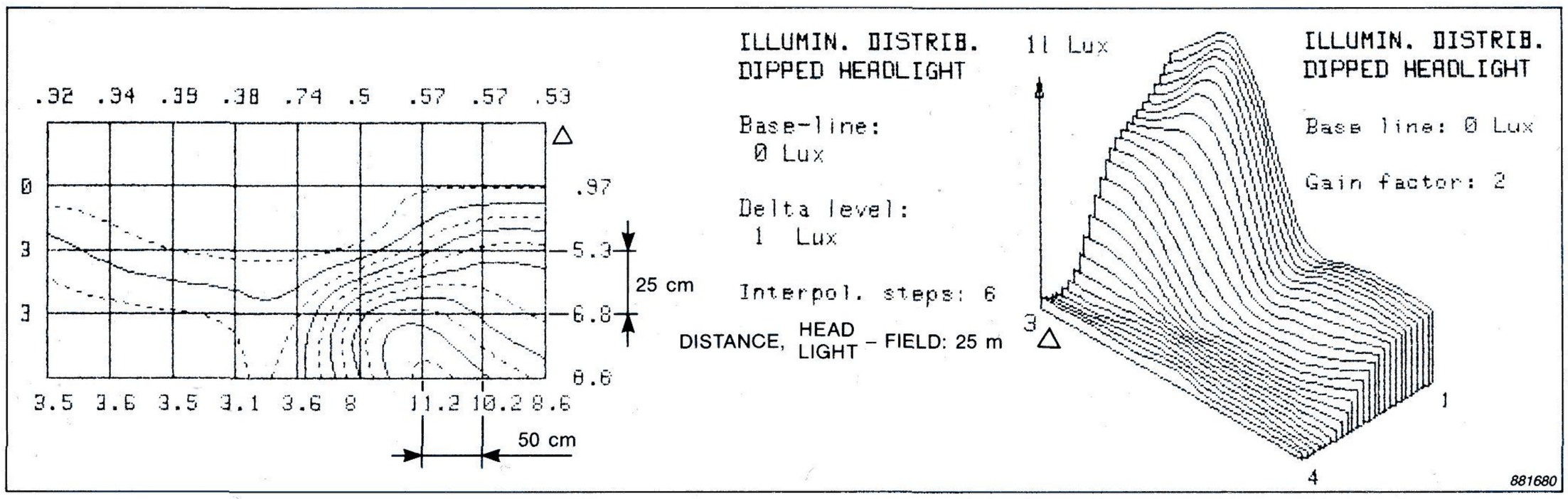

Fig. 4. Sample output from LUXMAP: dipped-headlight illuminance distribution

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