



*A NEMA Lighting Systems Division Document*

## **Ultraviolet Radiation From Fluorescent Lamps**

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May 4, 1999

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## ULTRAVIOLET RADIATION FROM FLUORESCENT LAMPS

In recent years the popular press has reported various scientific studies on possible effects of skin exposure to light sources. This interest has been stimulated by the facts that (1) most light sources emit some small amount of ultraviolet (UV) energy, and (2) extended exposure to the high UV levels in sunlight can cause adverse effects in the skin. Unfortunately, such brief summaries of technical subjects without either details or follow-up can cause undue concern among the public about indoor lighting.

Melanoma, the malignant form of skin cancer, has had increasing incidence over the past half century. Considerable research on causes of melanoma has looked at possible links with factors of modern life-style that have changed over the same period of time. In the early 1980's a suggestion was made that fluorescent lighting might be a cause of melanoma, but this suggestion could not be substantiated. In 1988, an international scientific review<sup>1</sup> concluded that "the available evidence does not support the existence of any substantial association between melanoma risk and exposure to fluorescent lighting." This conclusion stands today.

The two most common kinds of skin cancer are the non melanoma skin cancers<sup>2</sup>, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). These are slow growing cancers that seldom spread to other parts of the body. Nevertheless, treatment is essential because, as reference (2) points out, "[i]t is encouraging to know that skin cancer is now almost 100 percent curable if found early and treated promptly." BCC accounts for more than 90 percent of all skin cancers in the United States. In a recent publication, Lytle et al.<sup>3</sup> of the Center for Devices and Radiological Health (FDA) report that studies "indicate that SCC results from long-term chronic solar UV exposure, whereas solar UV exposure after age 10 may not contribute to BCC."

On this basis, one could expect that the small contribution of UV due to indoor lighting will not be a major health concern. Lytle et al.<sup>3</sup> addressed this by surveying 58 fluorescent lamp types for UV emission. Using these data, the UV exposure at typical office light levels was calculated for luminaires using large grid parabolic louvers that did not block UV. This estimated indoor UV exposure during one eight hour workday is equivalent to just over a minute of midday solar exposure on a clear July day in Washington, D.C. While there are different ways to interpret the UV due to fluorescent lighting, they all rely on a variety of assumptions. This comparison of the full day indoor exposure to roughly one-minute of outdoor exposure clearly conveys the relative insignificance of the UV from fluorescent lamps. In addition, many luminaire types and lighting techniques (enclosed luminaires, indirect lighting, etc.) will further reduce or eliminate the small amount of UV emitted from the fluorescent lamps.

In 1998 Driscoll and Pearson<sup>4</sup> of the National Radiological Protection Board (U.K.) reviewed the relation of UV from fluorescent lighting to skin cancers and presented results from new studies. Quoting from the summary, “[t]herefore, it is concluded that at commonly used illumination levels the measured UVR [ultraviolet radiation] emissions from fluorescent lighting do not present an acute or a significant chronic hazard.”

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<sup>1</sup> “Malignant Melanoma and Fluorescent Lighting,” CIE-Journal, 7:29 (1988)

<sup>2</sup> “What You Need To Know About Skin Cancer,” National Cancer Institute, NIH Publication No. 90-1564 (1989)

<sup>3</sup> C. Lytle, W. Cyr, J. Beer, S. Miller, R. James, R. Landry, M. Jacobs, R. Kaczmarek, C. Sharkness, D. Gaylor, F. Gruijl, and J. van der Leun, “An Estimation of Squamous Cell Carcinoma Risk from Ultraviolet Radiation Emitted by Fluorescent Lamps,” *Photodermatol Photoimmunol Photomed* 1992/1993, 9:268 (1993)

<sup>4</sup> C. Driscoll and A. Pearson, “Ultraviolet Radiation from Fluorescent Lamps for General Lighting,” *Croner’s Occupational Hygiene Magazine*, June/July, p.5 (1998)