

01-05 APPLICABILITY OF LIGHT-EMITTING DIODES AS LIGHT SOURCES FOR ACTIVE DOAS MEASUREMENTS

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We present the first use of light-emitting diodes (LEDs) as light sources for Long Path Differential Optical Absorption Spectroscopy (LP-DOAS) measurements of trace gases in the open atmosphere. Modern LEDs represent a potentially very advantageous alternative to thermal light sources, in particular xenon arc lamps, which are the most common active DOAS light sources to date. The radiative properties of a variety of LEDs were characterized, and parameters such as radiance, spectral shape, spectral range, spectral stability, how these can be influenced by environmental factors, and their role in DOAS applications were analyzed.

It could be shown that LEDs can successfully be used as light sources in active DOAS experiments measuring NO₂ and NO₃ around 450 and 630 nm, respectively. The novel instrumentation was used to conduct nitrogen oxide measurements over the cities of Heidelberg, Germany and Jerusalem, Israel. Selected results from these measurements will be shown to discuss measurement and evaluation techniques, and a short outlook into the future of LED technology and implications for LED-powered DOAS instruments will be given.

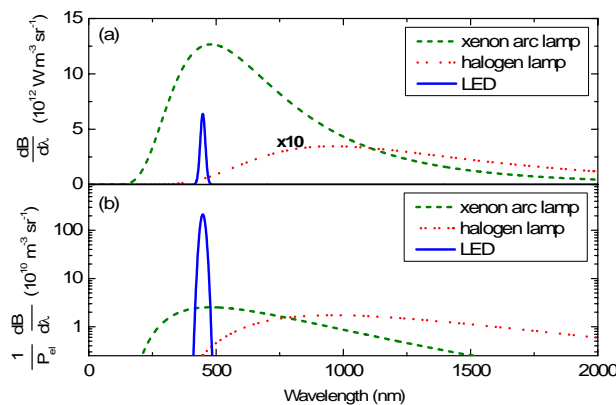


Fig. 1: (a) Estimated spectral radiance distribution of the Osram 450 W/2 XBO xenon arc lamp, a Luxeon LXHL-LR3C high power 3W royal blue LED, and a conventional tungsten halogen lamp (20W). Note that the halogen lamp spectrum is multiplied by 10 in this figure. (b) Spectral radiance normalized to the electrical input power of the individual sources.

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