

Emission of optical radiation by gas burners: A project with surprises

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Something about gas burners

Gas burners are widely used in glass manufacturing or processing. Heating, melting, or a controlled cool-down of the work piece is achieved by gas burners of different geometry and power. While working, employees' hands, arms, and face are exposed to strong incoherent optical radiation. Beside visible and infrared radiation, a substantial amount of ultraviolet radiation is emitted by the gas flame.

We examined numerous gas burners, which were chosen to mirror the mainstream of burners widely used at table work places. Beside measurements in our laboratory, we visited many workplaces.

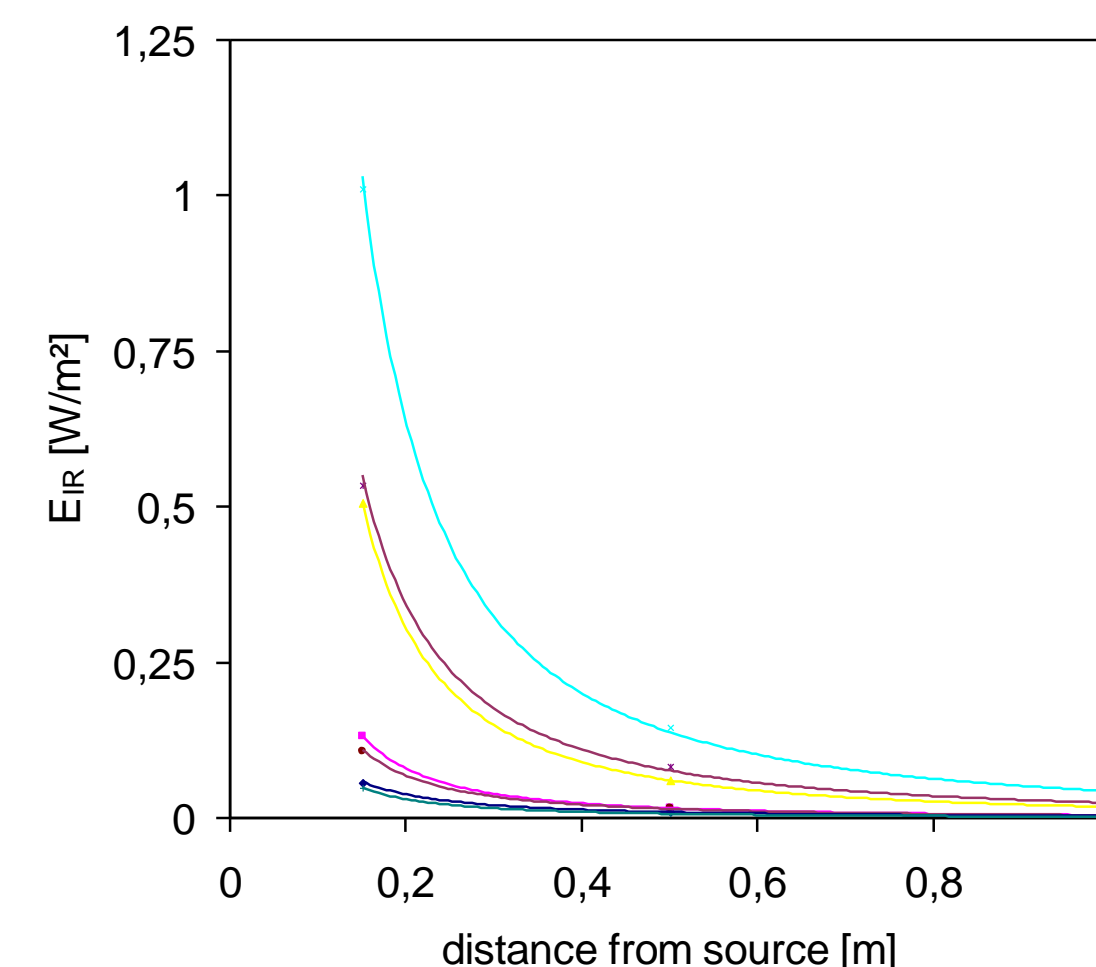
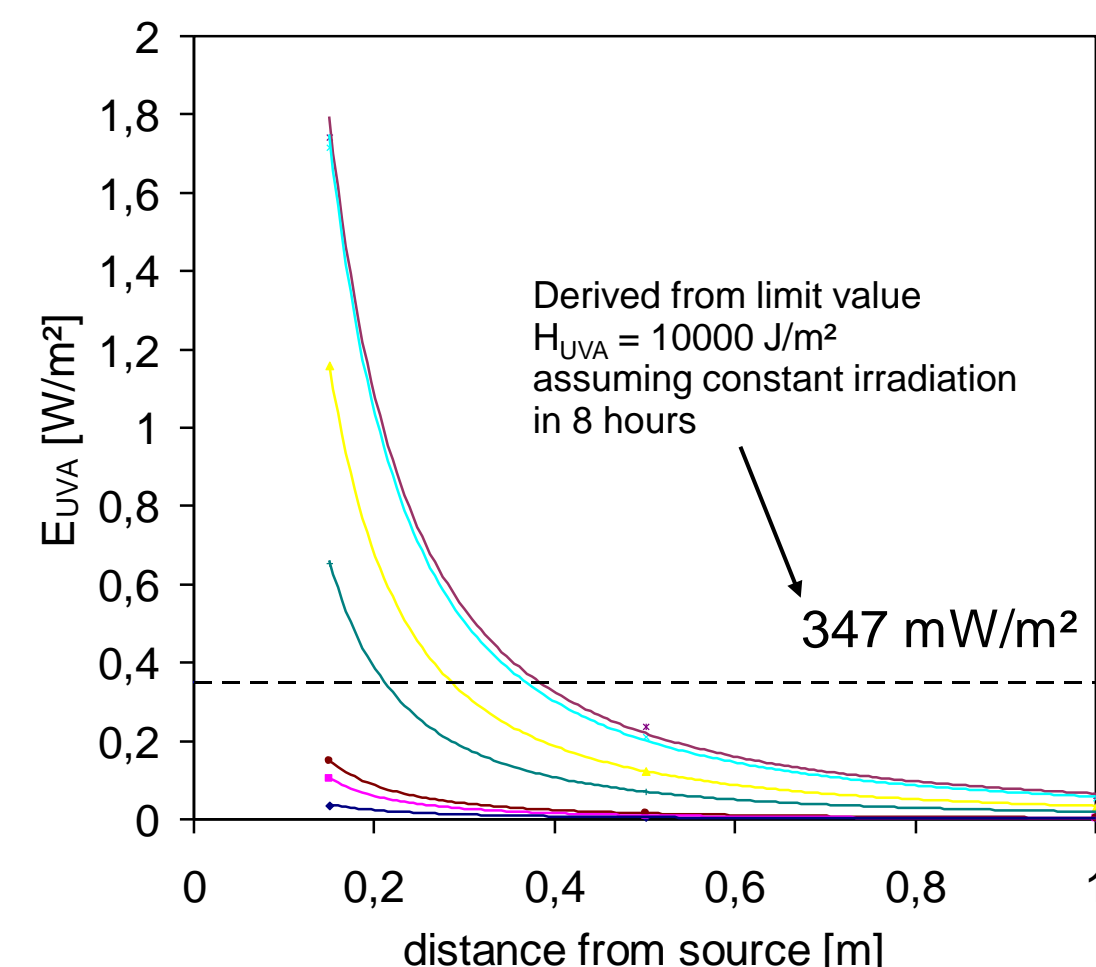
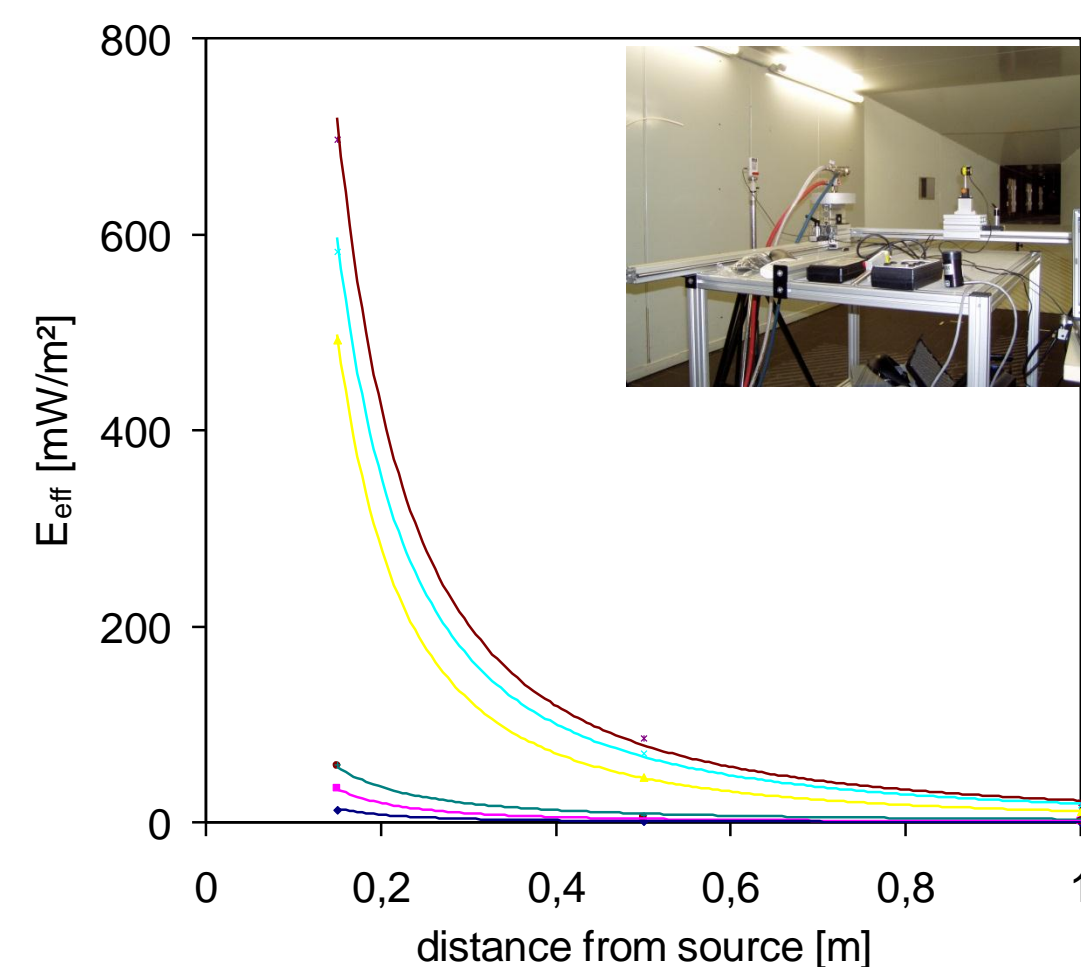
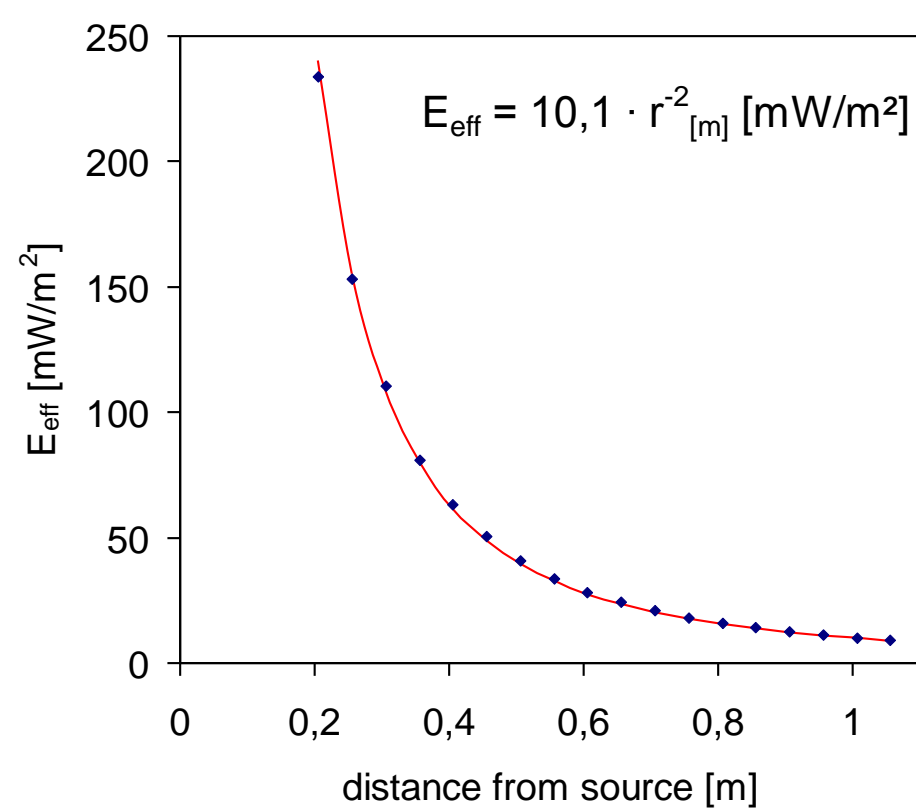


At table work places, mainly one burner is used, while many burners are used at once when manufacturing larger work pieces.

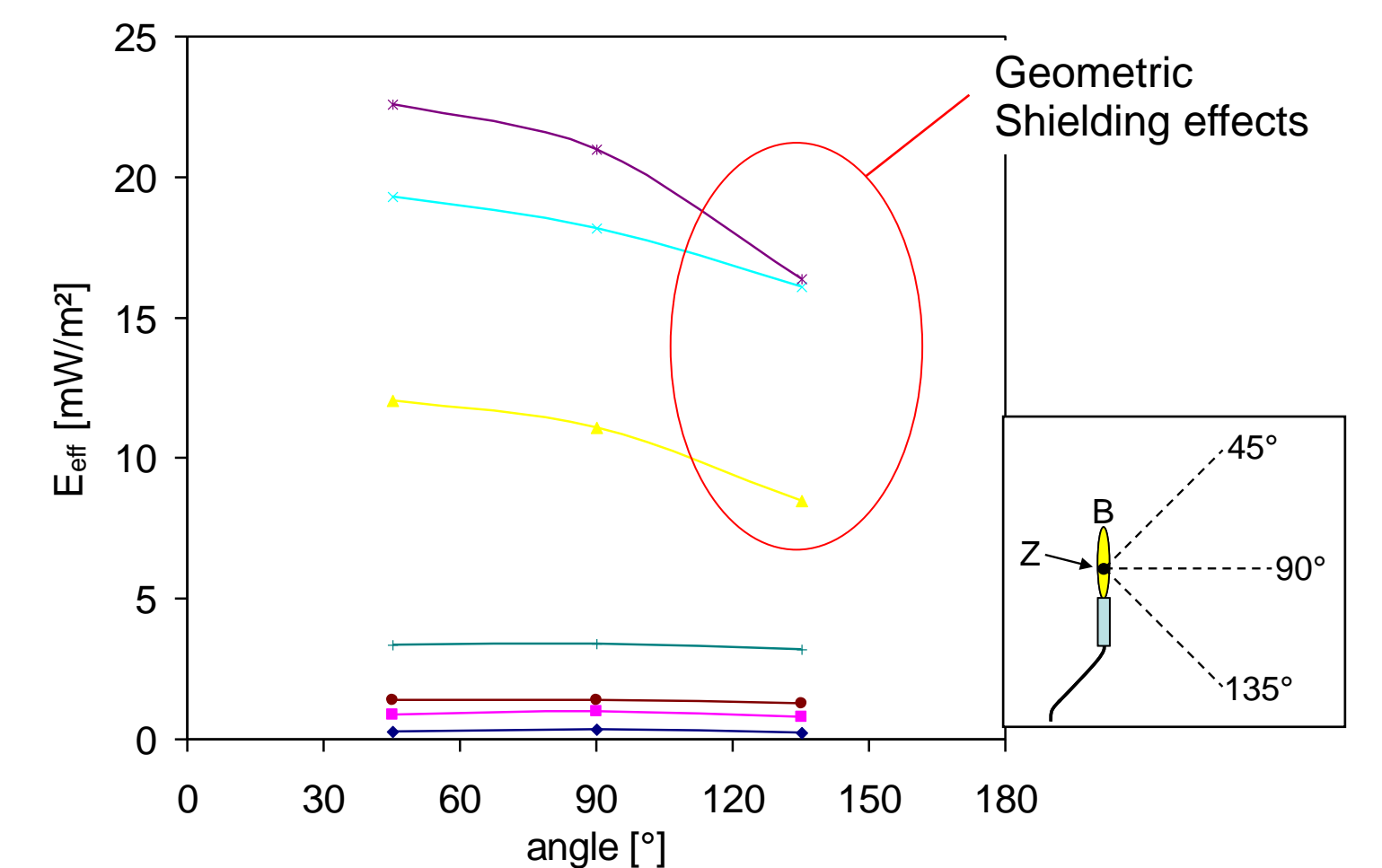
Measurements, Results and Facts

Irradiance declines quadratically with distance

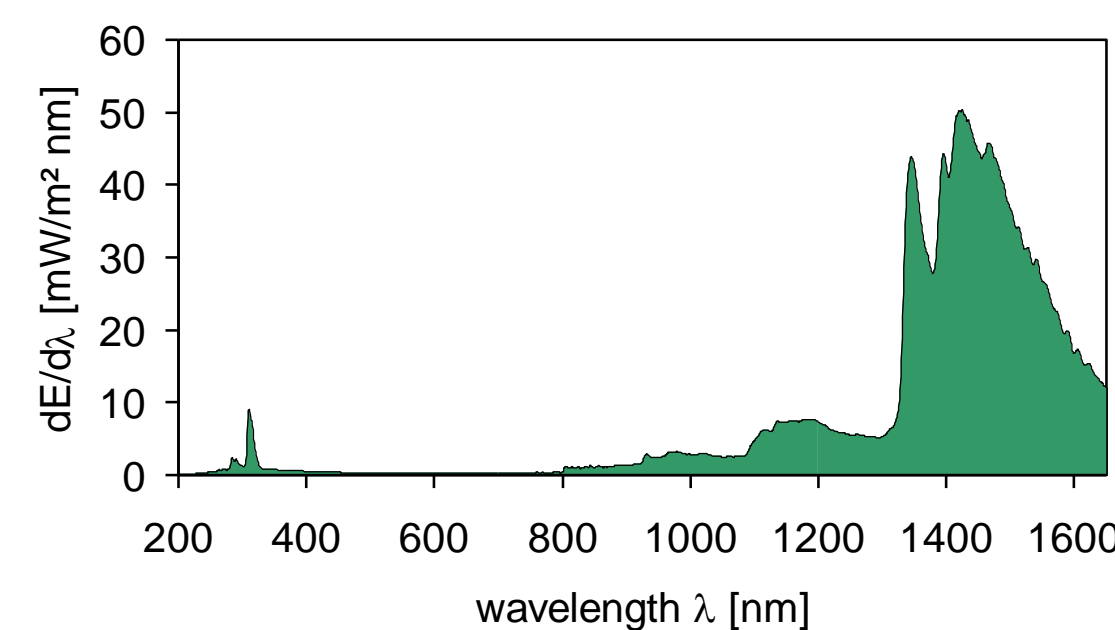
Gas flames can be stated as point sources:



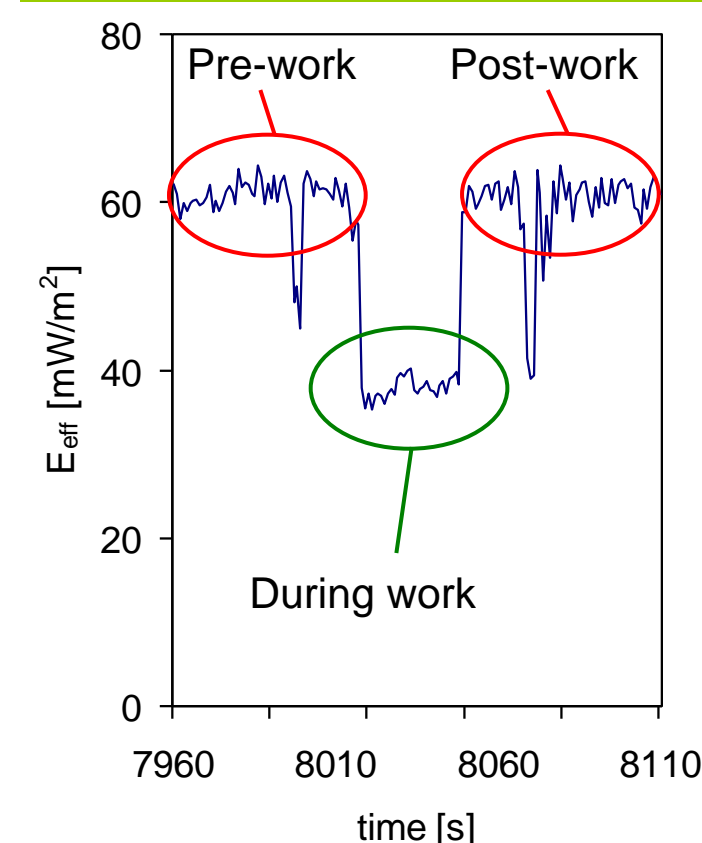
Irradiance is angular independent



Spectrum reveals prominent emission in UV and IR wavelength regime



Irradiance E_eff drops down while working with glass piece



...but E_{IR} increases!



Protecting People

Employees often deny to use protective measures, except glasses against glare caused by the strong yellow light during glass processing. They complain about wearing gloves (state to loose good touch) and wearing face shield (a flexible tube to blow air into the work piece has to be taken into the mouth).

All protective measures have to fulfill certain requirements. Beside technical needs, they have to be easy in use and not disturbing. The employee may forget them – while wearing them.



Pictures of glasses, face shield, and a glass plate mounted on a gas burner. All of these measures have pros and cons.

Outlook

Currently, we are finalizing our analysis on optical emission of gas burners in lab space and workplace. Furthermore, we want to elucidate further protective measures – always aiming at reducing the radiant exposure to an absolute minimum.

We are very anxious to implement protective measures in daily use and to sensitize employees and employers for the hazardous potential of gas burners.