

## Field laser applications in industry and research

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The second international conference on *Field Laser Applications in Industry and Research—FLAIR* was held from September 6–11, 2009 near Garmisch-Partenkirchen in the Bavarian Alps facing Germany's highest mountain, the Zugspitze.

FLAIR in general presents state-of-the-art lasers, components, software and systems, which are used for diagnostic purposes in applied spectroscopy, stable isotope ratio measurements, environmental research, medicine, life sciences and agriculture, plasma and combustion, atmospheric research and in industrial applications [1]. Poster sessions together with an exhibition provide the platform for information exchange between representatives from research and development laboratories, industry and users. FLAIR 2009 provided overview lectures by international experts emphasizing integrative and multi-disciplinary approaches. FLAIR attracts not only spectroscopists, but also scientists with detailed analytical requirements to solve measurement challenges identified in different research areas, even far away from the field of laser spectroscopy. Stimulating discussions always lead to new ideas, cooperation and projects between scientists, between researchers and industry and in the business to business field.

We have maintained the style of the conference and the participants could enjoy a week of tight interaction. The activities of the conference have been distributed among dif-

ferent locations: invited and contributed lectures have been held at the Grainau Conference Center, posters and exhibition at the conference *Hotel am Badersee*. The hotel located in an alpine village, the excursions, conference dinner in very special locations, even the short walks in the forest from the *Hotel am Badersee* to the Conference Center have contributed to a relaxed and stimulating atmosphere. The FLAIR 2009 Industry session was held at the “Top of Germany” on the Zugspitze glacier providing an impressive overview of state-of-the-art diode-lasers and commercial spectroscopic instruments as well as a perspective beyond the horizon for the audience. FLAIR participants and accompanying persons enjoyed a spectacular sunset over the Alps with 80 km visibility and some climbed up to the summit at 2962 m (Fig. 1). The dinner at the panorama restaurant on the top of Zugspitze remains as one of the most impressive events a conference may offer to stay together with old and new colleagues, customers and friends for furthering laser applications in industry and research as a cross-disciplinary science.

Following the concept of FLAIR we have selected invited speakers among scientists working in different research areas, in order to cover the wide range from basic research to field laser applications. A key issue for the oral presentations was to avoid the “usual suspects” (in the memorable 1942 movie *Casablanca* starring Humphrey Bogart and Ingrid Bergman, Claude Rains as Captain Louie Renault was often heard to say “round up the usual suspects”). The fact that we succeeded to select for all presentations speakers which did not give a talk at the previous FLAIR demonstrates clearly how rich and vital this field of research is.

From 100 talks and poster contributions, some papers have been selected to represent in this special issue a balanced overview of the liveliness and the scientific diversity within field laser applications in industry and research.

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**Fig. 1** FLAIR 2009 at the “Top of Germany” (Photo by Barry McManus)

With respect to new frontiers, the paper by P. De Natale and coworkers presents a review of new possible sources and techniques for gas detection and metrology based on quantum cascade lasers and frequency-comb synthesizers [2]. As for methods, techniques and spectroscopic data, the work by Laurila and coworkers deals with a technique for the calibration of CEAS experiments with supercontinuum radiation [3]; So, Jeng and Wysocki have discussed the advantages of Faraday Rotation Spectroscopy for the case study of oxygen detection [4]; spectroscopic data suitable for the design of isotopic ratio measurements in  $\text{NH}_3$  have been measured by Lins and coworkers [5]; Welzel and Röpcke have analyzed non linear effects, namely asymmetrical line broadening and saturation, caused by short pulse laser beams [6]. The assessment of the instrument performance is discussed in depth in the review paper by P. Werle about the effects of optical fringes and turbulence on accuracy and precision of spectroscopic measurements [7]. Three papers deal with applications to combustion diagnostics: the paper by Löhden and coworkers describe advantages of intracavity absorption spectroscopy for trace gas detection in a combustion process [8]; the paper by Porter, Jeffries and Hanson describes a dual-wavelength mid-infrared laser diagnostic approach for the simultaneous measurements of vapor-phase fuel mole fraction and liquid fuel film thickness in hydrocarbon flames [9]; Iannone and coworkers deal with combustion optimization by measuring the frac-

tion of unburned carbon with respect to ashes in the exhaust gas [10]. A particular kind of OPO source, suitable for cavity ringdown spectroscopy of isotopic species, especially for breath analysis, is described in the paper by Rihan and coworkers [11]. The integrated cavity output spectroscopy technique, applied to the isotopic ratio measurement of atmospheric methane, is the subject of the paper by Witinski, Sayres and Anderson [12]. The final four papers deal with devices for atmospheric monitoring: Chen and coworkers propose a self calibrating carbon monoxide analyzer with a reference cell embedded in the optical detector [13]; McDermitt and coworker developed a fast and precise open path analyzer with very low power consumption for the measurement of ecosystem fluxes of methane in remote areas [14]; Sonnenfroh and Parameswaran describe a high precision  $\text{CO}_2$  analyzer for applications in distributed measurement networks [15]; Lee and coworkers have developed an analyzer for fast and simultaneous detection of HONO and  $\text{NO}_2$  for monitoring applications [16].

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FLAIR 2011 will be held in Murnau (D), in the period September 13–17 (<http://imk-ifu.kit.edu/flair>).

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