

LIBS SPECTROSCOPY: WHAT WE CAN MEASURE, AND HOW?

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Abstract. Laser Induced Breakdown Spectroscopy (LIBS) is a versatile technique for rapid elemental analysis of samples in various environments. At ENEA's laboratories of Frascati, we have built and tested different LIBS instruments, among them a portable static or handheld sensor for forensic examinations on a crime scene (Lazic et al. 2024), a compact LIBS tool mounted on a robotic arm (Almaviva, et. al. 2019) and the Integrated Laser Sensor (ILS) for sequential stand-off target scanning by laser scattering and Laser Induced Fluorescence (LIF), Raman, and LIBS techniques (Lazic et al. 2019). This presentation briefly reports the methods used for LIBS sampling, the implemented data processing, and the obtained analytical results for various case studies. The examples include: the depth profiling of multi-layered solid targets (coatings, paints and inks), measurements on liquid droplets (oils or water solutions), on particles in traces (e.g. soils, explosives), underwater analysis of the medium and of submerged solid or soft (e.g. sediment) targets. Beside the optimized experimental approach, the retrieval of correct information about samples starting from the LIBS spectra requires a proper use of the atomic databases, then identification of sources of the signal fluctuations and their minimization also through the data processing. In many cases, taking into account shot-to-shot variations of the plasma parameters during the LIBS measurements is of the outmost importance for obtaining element quantifications in samples.

References

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