



**COUNTER IMPROVISED EXPLOSIVE DEVICE (C-IED)  
MEETING 6-7 APRIL 2005  
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# **FIBER-OPTIC LIBS COMBINED WITH LASER DESORPTION AND ION MOBILITY SPECTROMETRY FOR DETECTION OF EXPLOSIVE RESIDUES**

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# Overview



1. Introduction to fiber-optic LIBS
2. An example of how fiber-optic LIBS can be deployed in demanding environments
3. Laser Desorption (LD) and how it may be combined with Ion Mobility Spectrometry (IMS)
4. A combined fiber-optic LIBS, LD and IMS probe for remote detection of explosives residues
5. The potential for a unmanned roadside checkpoint instrument based on LD / IMS
6. Summary



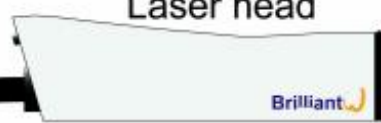
# The basic principle of LIBS



Laser power supply



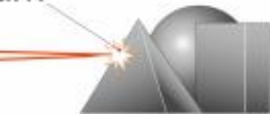
Laser head



Focussing lens



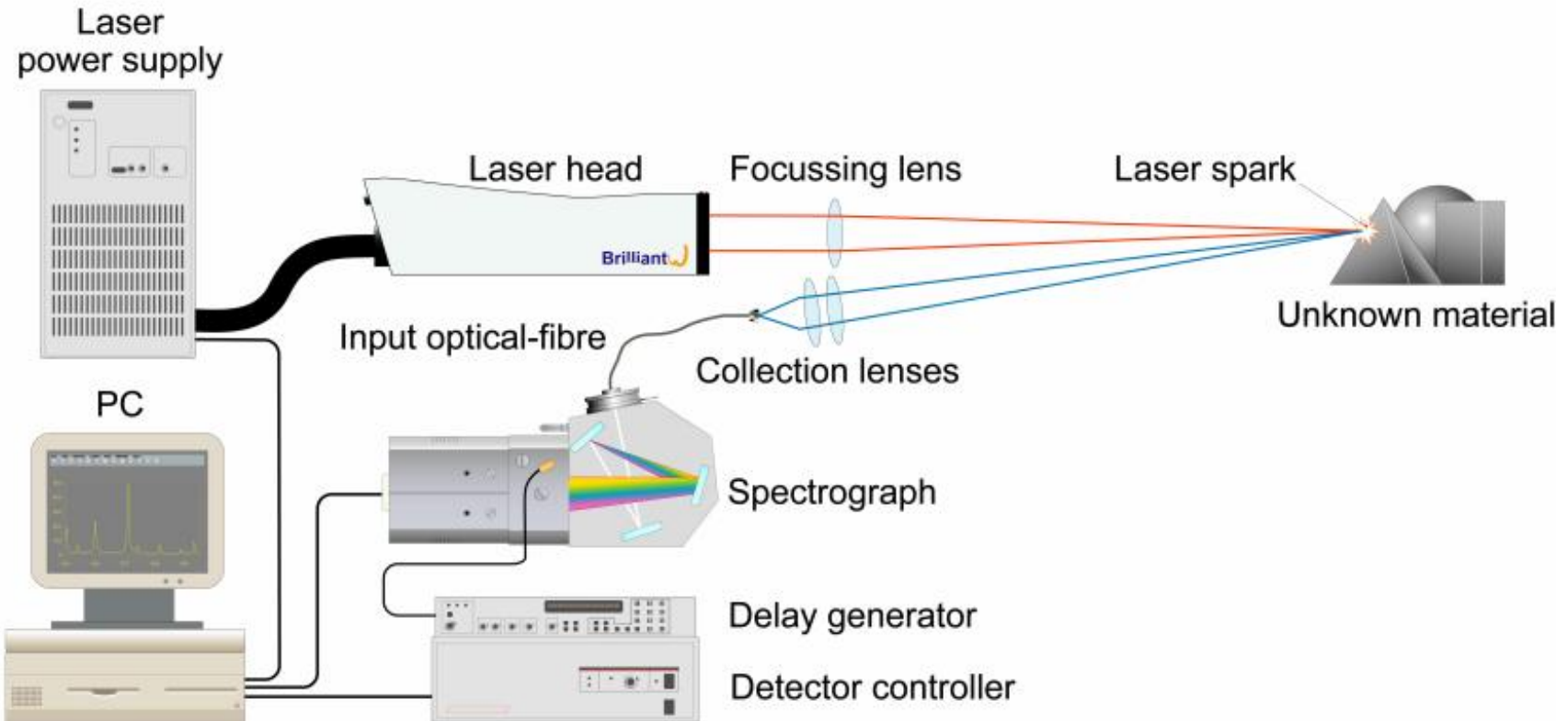
Laser spark



Unknown material

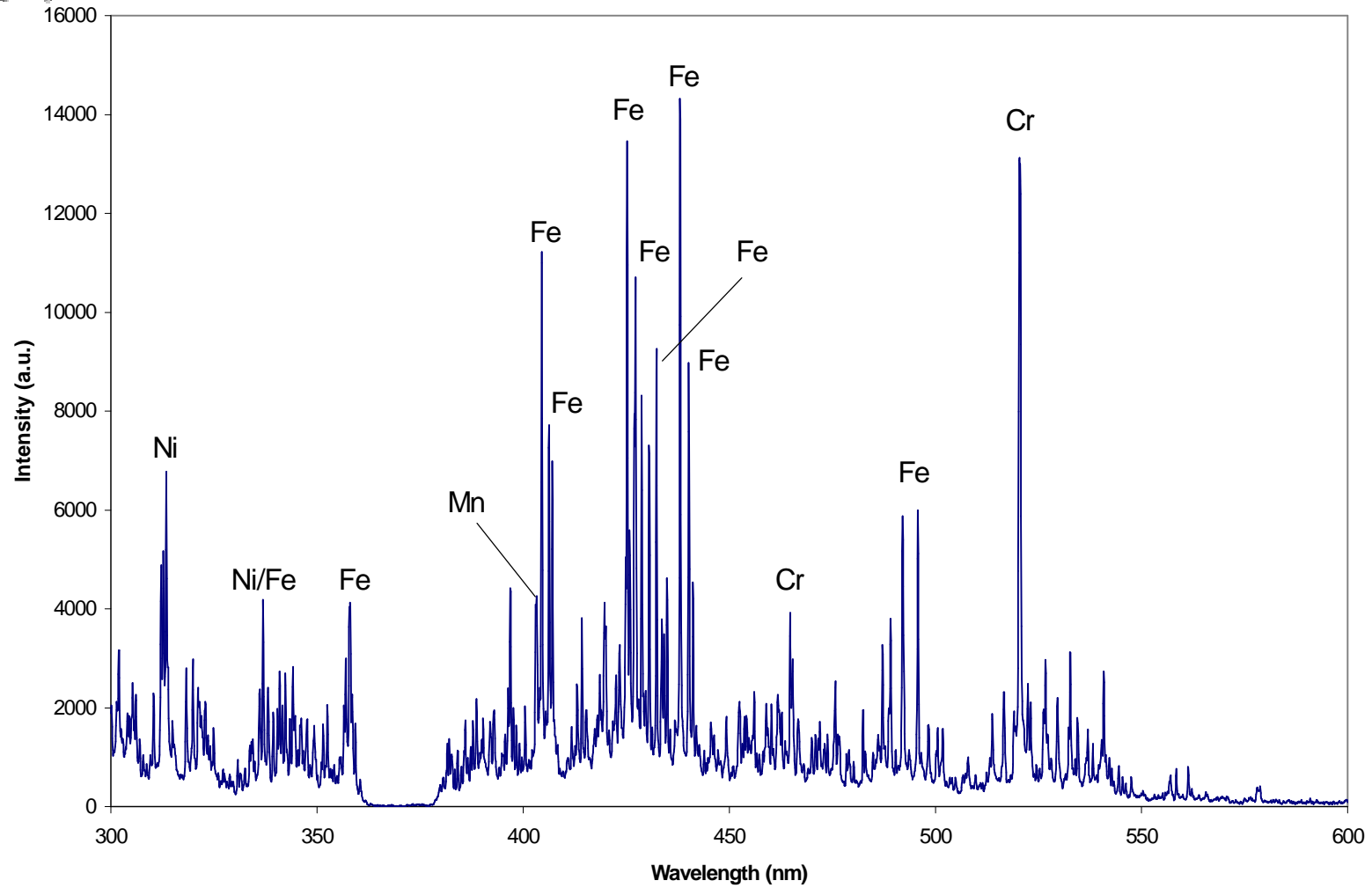


# The basic principle of LIBS



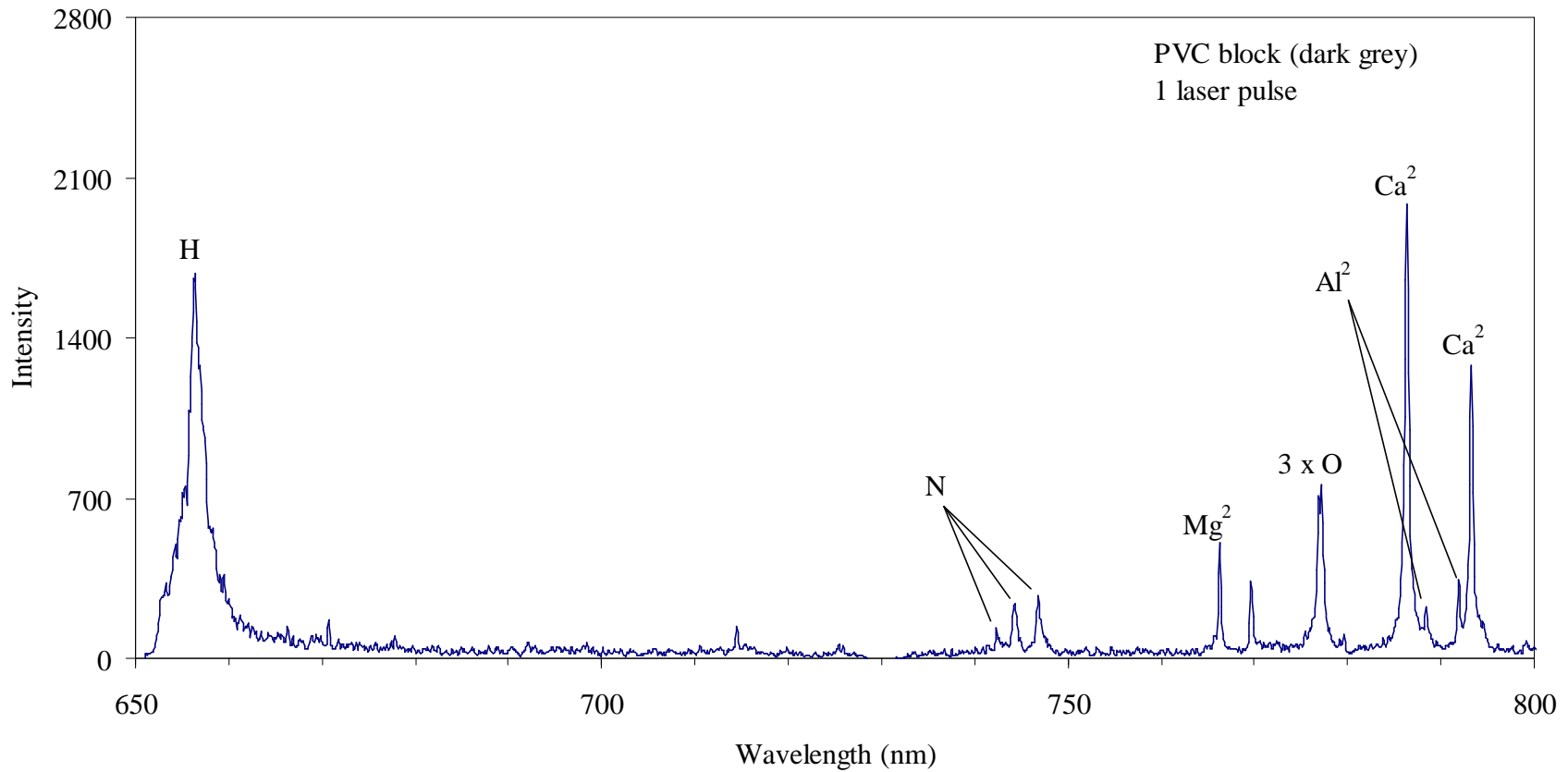


# Spectrum obtained during LIBS analysis of 304 stainless steel



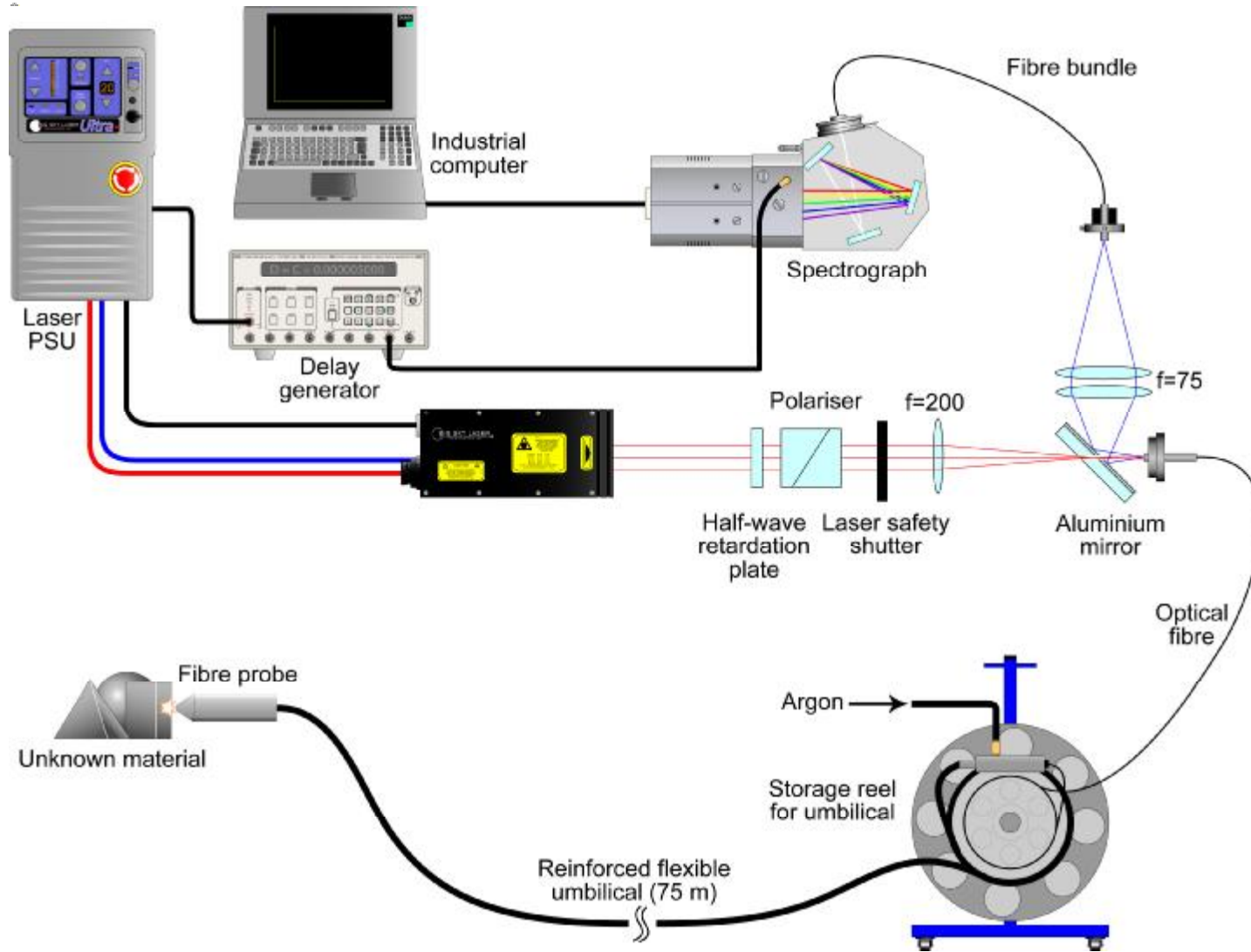


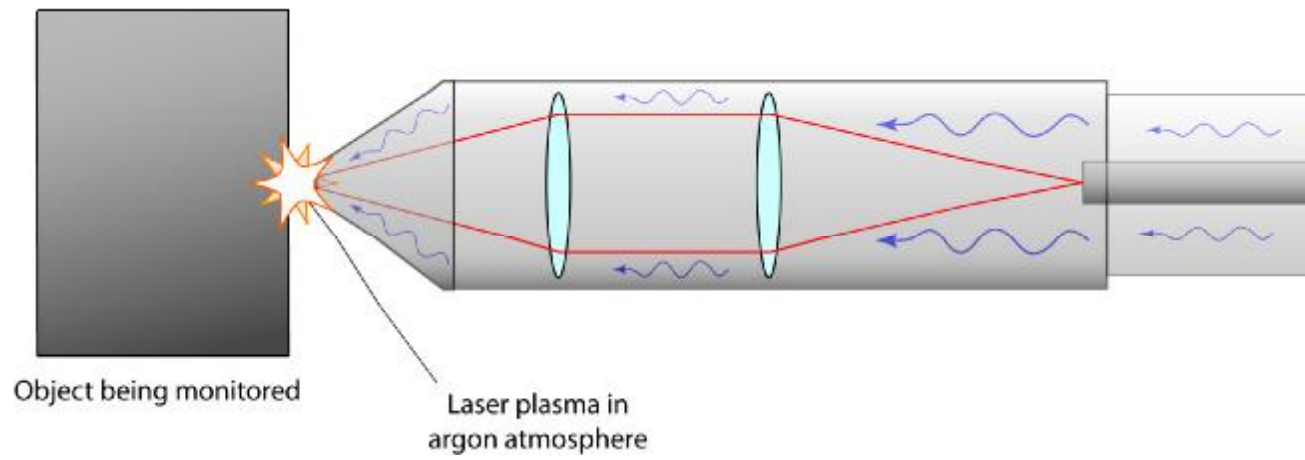
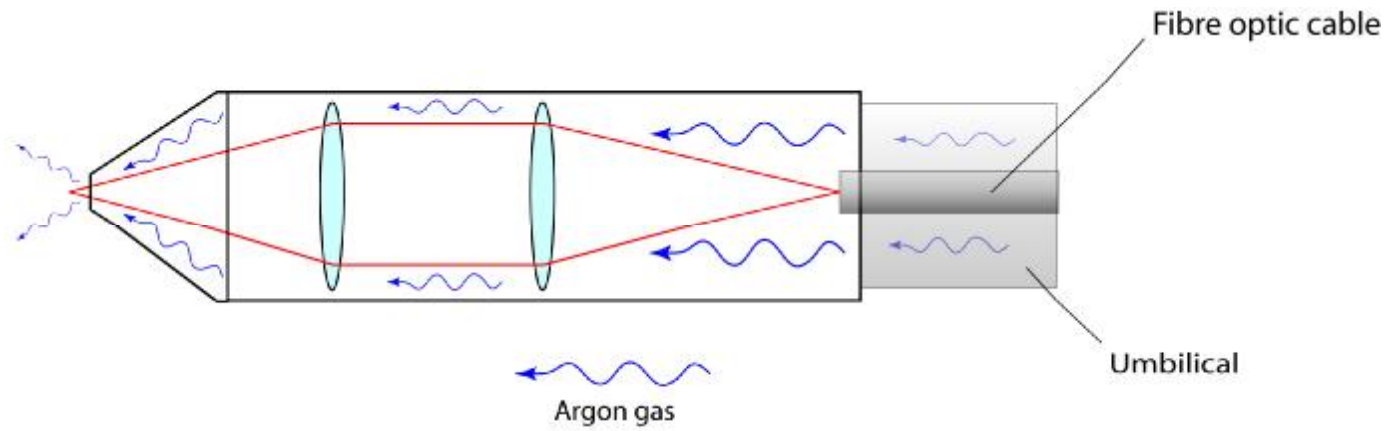
# Spectrum obtained during LIBS analysis of PVC





# Schematic of Fiber-Optic LIBS instrument with argon gas purge







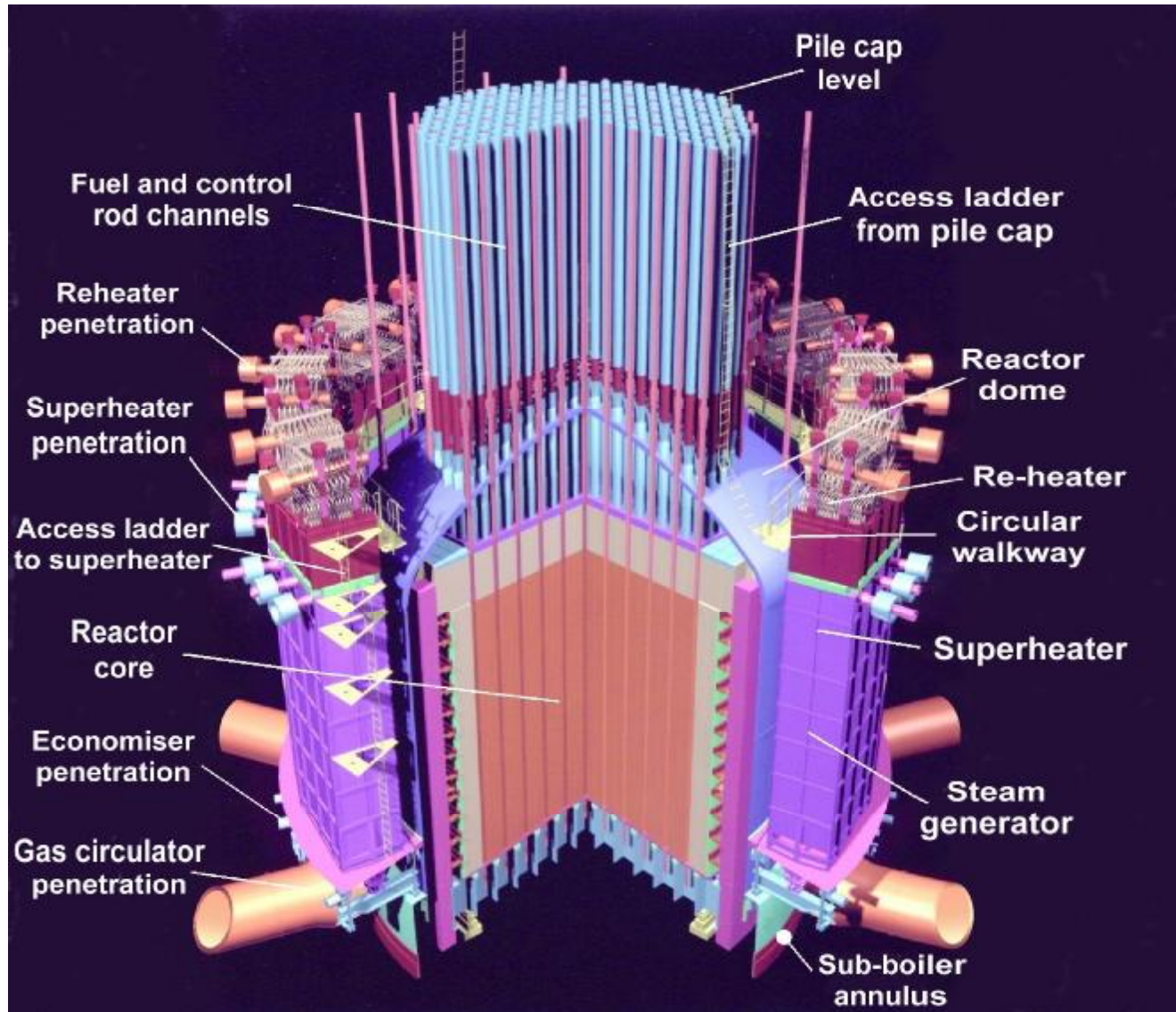


# Pile cap area of an Advanced Gas-cooled Reactor (AGR) power station





# CAD view of an AGR



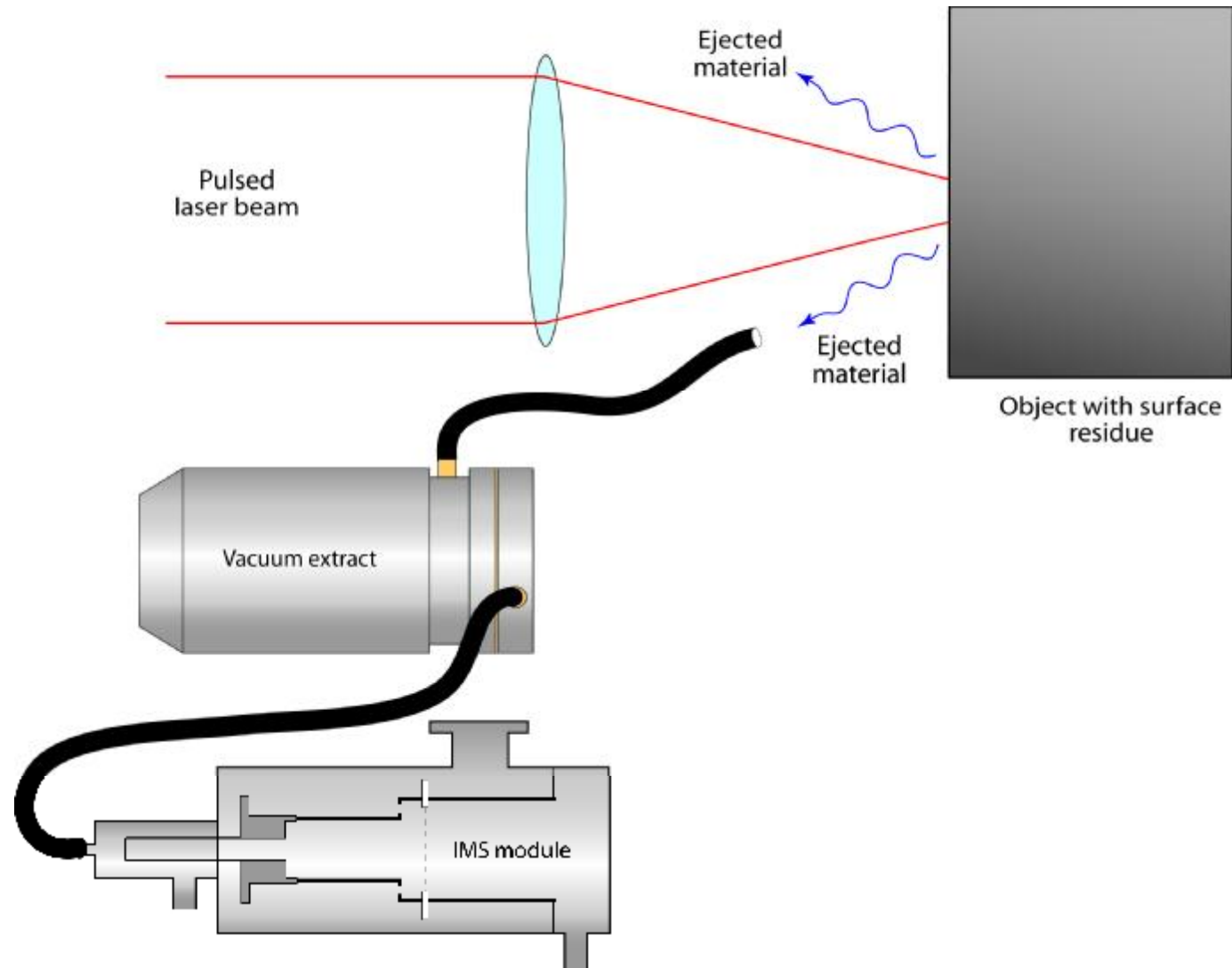


# Deployment of LIBS probe inside an AGR superheater





# Laser Desorption





# Video



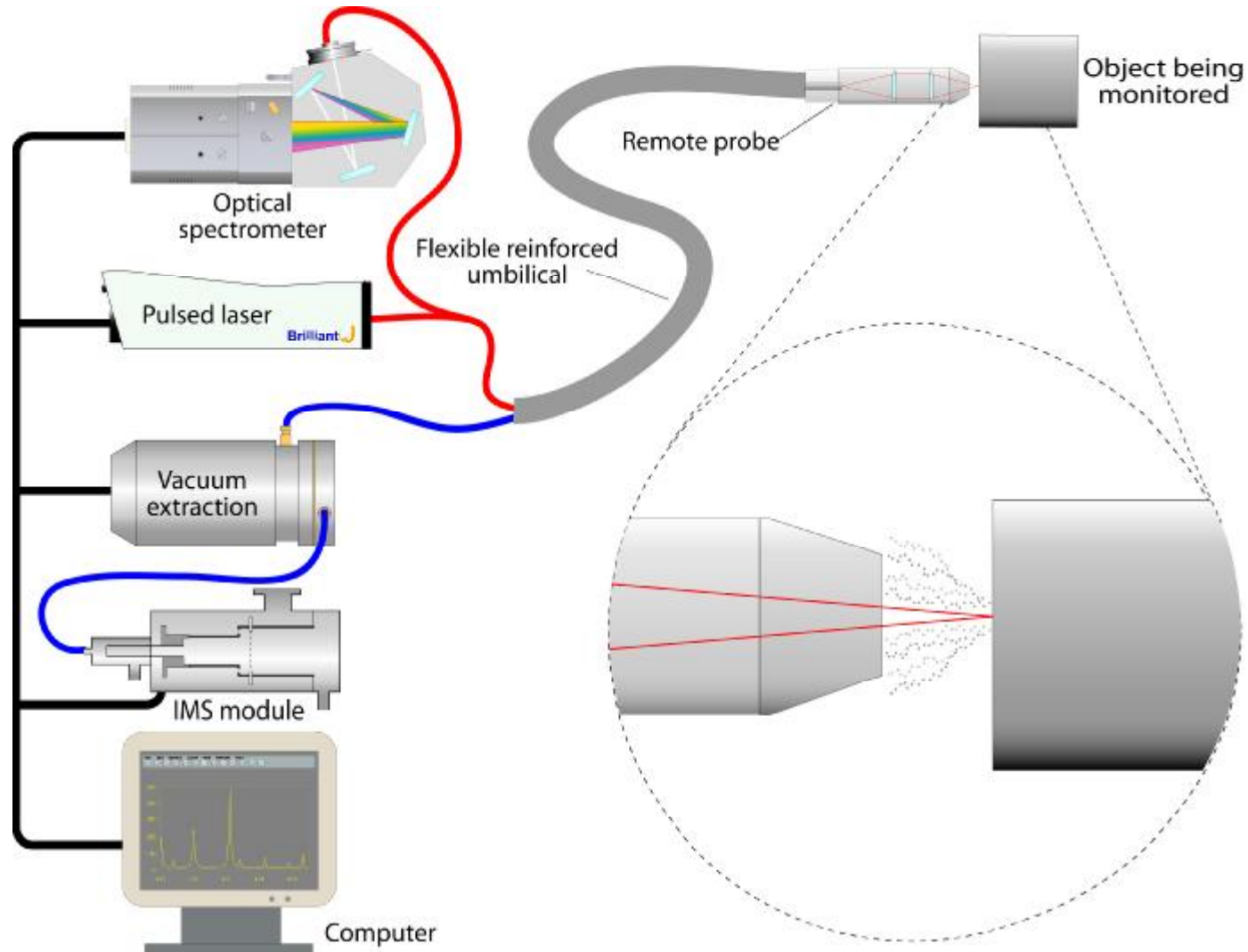


# Video





# Combined Fiber-Optic LIBS, LD and IMS probe

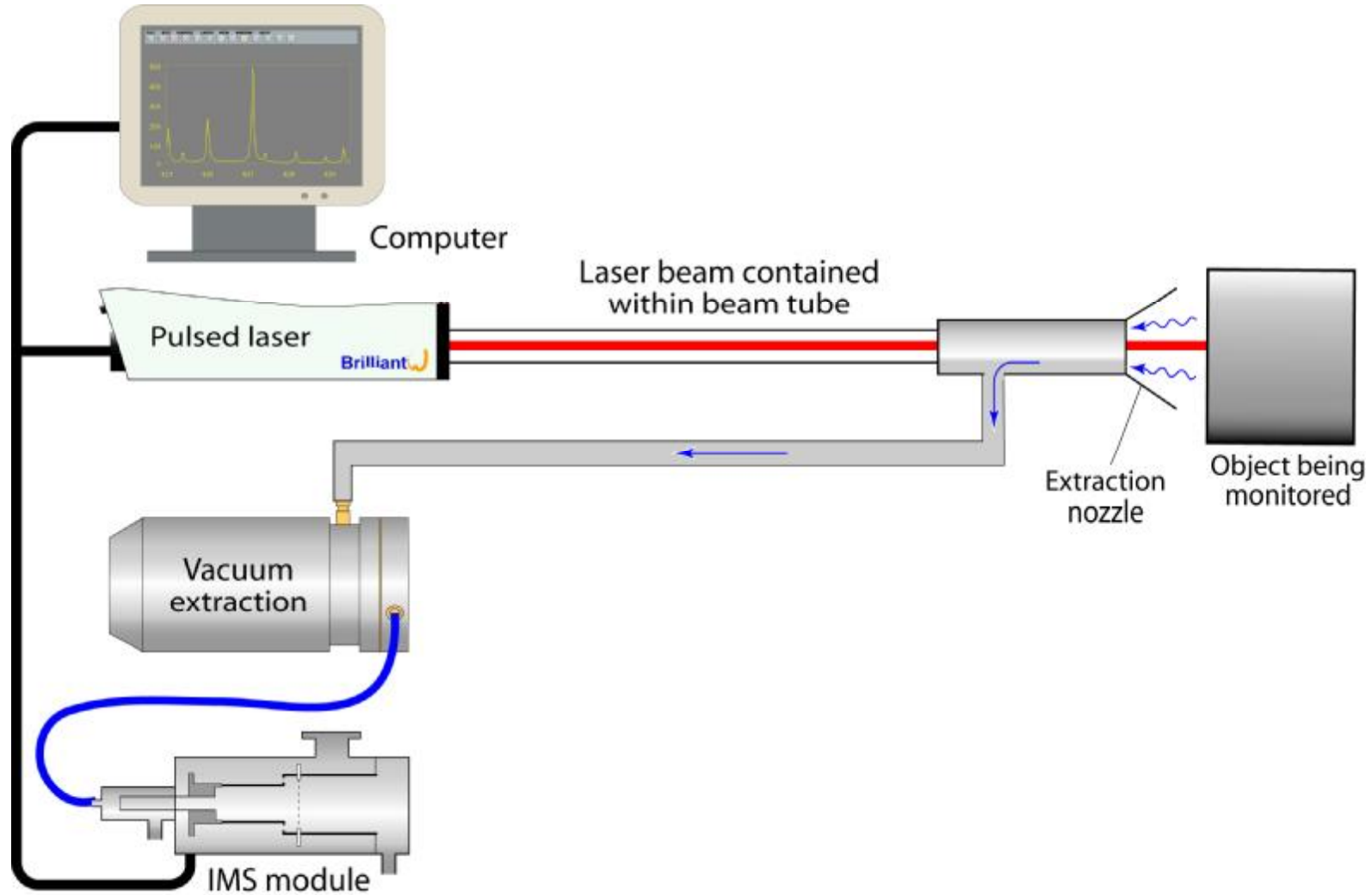






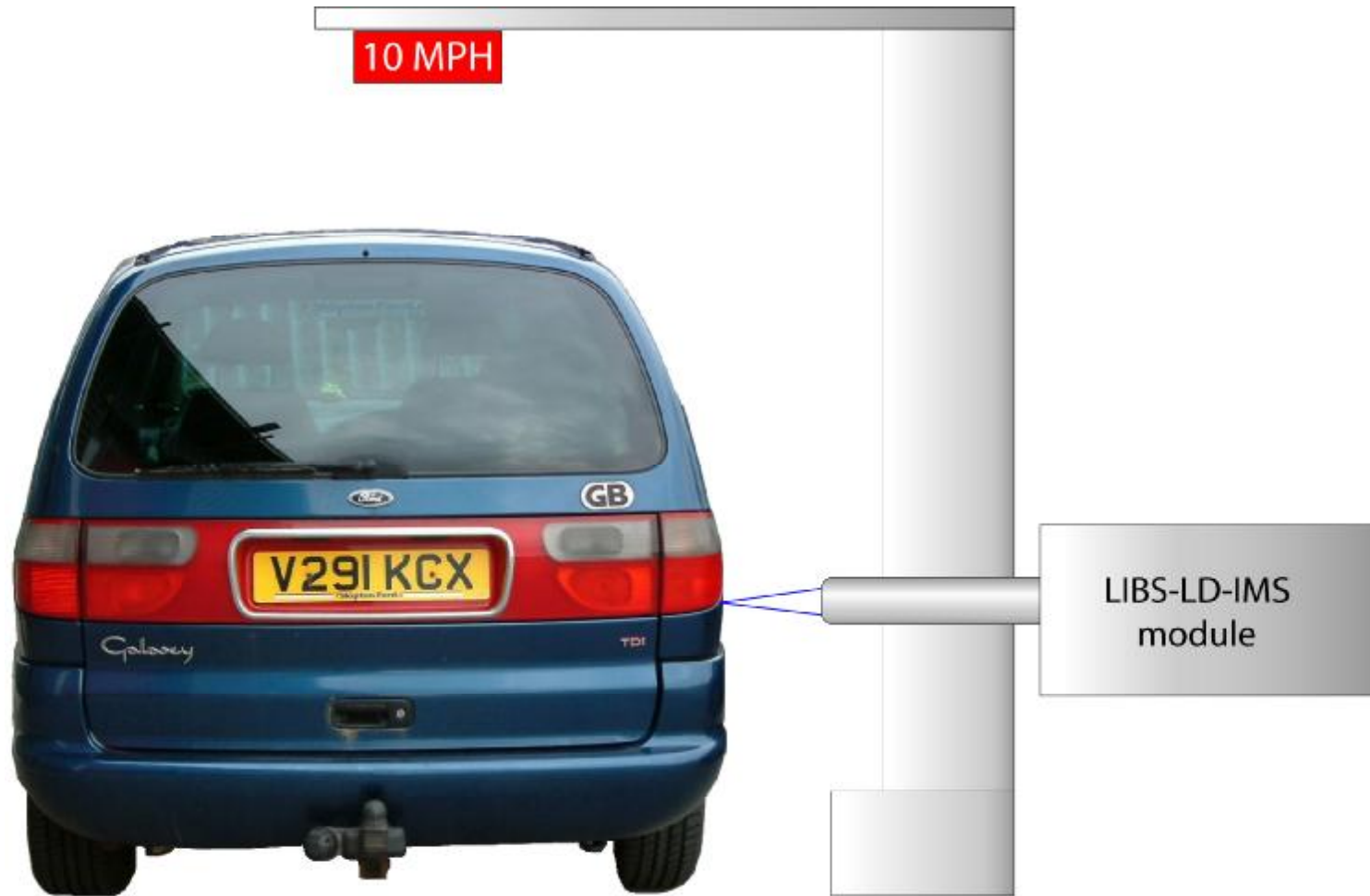


# Roadside checkpoint instrument based on LIBS / LD / IMS





# Artists impression of roadside checkpoint instrument





## Summary



- Fiber-optic LIBS useful for deployment in hostile environments – expensive equipment can be located up to 100 metres from object being analysed
- Fiber-optic LIBS with argon gas shroud helps to minimise signals from ambient air ( $N_2$ ,  $O_2$ )
- Laser Desorption (LD) combined with Ion Mobility Spectrometry (IMS) has considerable potential for detecting trace explosive residues on surfaces without damaging the substrate
- LD, IMS and LIBS may be combined to realise a powerful tool for remote analysis of surface residues