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The measurement of air pollution is becoming one of the most important applications of optical remote sensing techniques. It has often been suggested that techniques such as Differential Absorption Lidar (DIAL) and other long-path measurement techniques are highly suitable for this type of application. However, until recently, the number of practical applications demonstrated has been relatively small. There are two major reasons why optical remote sensing is now being used increasingly for air pollution measurements:

### **1 Improvements in the performance of DIAL and long-path measurement systems**

The most important improvements in performance have been the increase in the number of species that can be measured and the trend towards less complex and more reliable systems.

Particular examples include:

- The availability of tunable solid-state laser sources in the visible and near-infrared (eg Ti-Sapphire),
- The use of the DIAL technique in the 3 to 3.5  $\mu\text{m}$  region,
- The development of portable FTIR instruments for measuring toxic gases and the use of the DOAS technique for measuring ambient air quality.

### **2 Increasing demands for pollution measurements**

The extent to which new techniques have been demonstrated has been strongly linked to the detailed requirements for pollution measurements from industry and Governments around the world. In general, there are three motivations for performing air pollution measurements:

- To demonstrate compliance with air quality and occupational exposure standards,
- To demonstrate compliance with emission limits and to compile and verify emissions inventories,
- Scientific investigations into the transport and transformation of pollution.

Many of these applications require traceable calibration and measurements that are made under conditions specified by regulations.

#### **Summary**

DIAL and long-path measurement techniques have been successful in pollution measurement applications when:

- They are able to make measurements that conform to regulatory requirements,
- They provide measurements that are complementary to other techniques,
- The cost and complexity are in proportion to the benefits.