Optical diagnostics is an advanced tool used in the research and development of various products involving flow and combustion across domestic, industrial and transport sectors. New cutting edge diagnostics capabilities place the Science City Research Alliance at the forefront of research into the optimization of flow and combustion processes and system designs. One of the main applications is in improving the efficiency of combustion engines in order to achieve high fuel economy and low carbon emissions.
TYPICAL APPLICATIONS INCLUDE (NOT EXCLUSIVELY):
- Household burners
- Large scale local heating
- Power stations
- Steel furnaces
- Internal combustion engines
- Gas turbine engines

KEY FEATURES AND TECHNICAL SPECIFICATIONS:

Based at the University of Birmingham

- A PIV/LII/PLIF system for mixture preparation and combustion diagnostics. It consists of a TDL90 dye laser, pumped by a Nd:YAG laser, covers a range from 200nm to 450nm, with max. energy 20–500 mJ/pulse. It can measure flow field velocity vectors and turbulence, soot concentrations, mixture distributions and combustion product species in the engine cylinder. The system includes:
  - 2D high speed (7.5kHz) Particle Image Velocimetry (PIV) - planar measurement of flow field, continuous velocity measurement with data acquisition;
  - 3D Laser Doppler Anemometry (LDA) point measurement of velocity and turbulence;
  - 3D Phase Doppler Anemometry (PDA) point measurement of liquid droplet velocity and size distribution;
  - 2D tuneable Planar Laser Induced Fluorescence (PLIF) - quantitative measurement of in-cylinder fuel mixture and combustion product distribution with high temporal and spatial resolution; and
  - 2D Planar Laser Induced Incandescence (PLII) - soot formation and distribution measurement.

- A Phantom speedsense V710 high speed ICCD camera with (1024x1024@3000fps, 512x512@10,000fps, top speed 1,500,000fps) colour imaging system with an intensifier can be used for the study of combustion phenomena.

- A Shimadzu Hyper Vision HPV2 (Maximum speed: 1,000,000 fps Resolution: 320*240 fixed) ultra-high speed camera is used for recording ultra-high-speed phenomena not previously possible in a wide variety of fields that require high-speed image capture, involving fluid dynamics, fuel spray and combustion.

Based at the University of Warwick

- A boreoscopic engine investigation system that allows investigation of an internal combustion engine using an endoscope approach, providing an in-cylinder visualisation system which can be operated in conjunction with a number of well accepted flow measurements techniques – PIV, laser fluorescence and direct light emission being examples.