University of Nottingham
UK | CHINA | MALAYSIA

ADDED SCIENTIFIC

Technology for Licence

Compact Spectroscopy Apparatus

using additive manufacturing

In brief

A miniaturised device for performing saturated absorption spectroscopy on two lasers simultaneously. It can also produce a beat signal between one of these two lasers and a third. It provides all the spectroscopic signals required to stabilise the lasers typically used for making and studying a magneto-optical trap for Alkali atoms such as Rb, Cs and K.

This device is far smaller, cheaper and more stable than existing equivalents. The improvements are achieved by:

- the efficient use of optical components, comprising of a minimum number of elements in the device,
- the replacement of traditional optomechanical mounting devices with a single additively-manufactured holding structure securing all of the components,
- the minimised optical path lengths. This increases the ability to tolerate misalignment and reduces the importance of small beam misalignments arising from unwanted environmental disturbances (e.g. temperature changes and vibrations).

Specifications	
Filling	Alkali atoms
Optical Input Configurations	3x SM optical fibres (polarisation maintaining)
Input Power Range	0.5 to 5 mW per beam
Supported Locks	2x current modulation, 1x optical beat
Doppler Subtraction	Yes
Response Bandwidth	10 kHz (spectroscopy), 500 MHz (beat)
Temperature Stabilisation	Not currently, could be added
Photodetection	Silicon photodiodes
(Housing) Dimensions	112 x 33 x 66 mm
Input Fibre Termination	Standard patch cable connector
Reference Cell Temperature (Max.)	40 °C (estimate)
Dimension of gas cell	25 mm dia. cylinder, 50 mm long
Electronic Outputs (BNC Sockets)	Bare photodiode pins

Key benefits:

Considerable reductions in size, weight and cost over existing technologies

Improved stability against environmental disturbances

Turn-key device, no alignment by the operator required

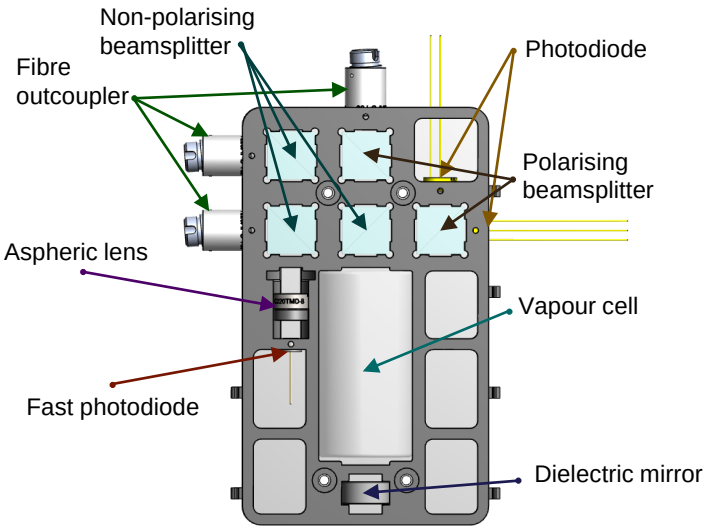

Fig 1: A labelled diagram of each of the components. Specific parts were used in the prototype model, details of these are available.

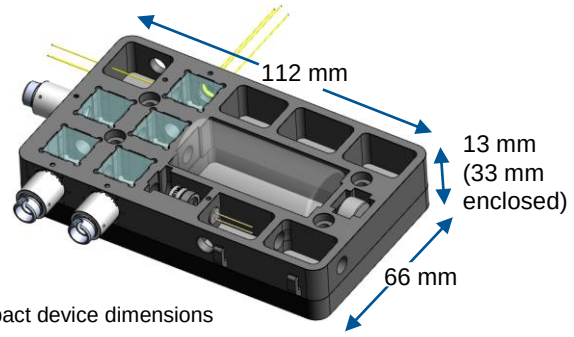

Fig 2: Compact device dimensions

IP

- Patent published (GB2590352)
- Technical drawings
- .stl file

Enquiries

Sarah Newman
Commercialisation Officer

sarah.newman@nottingham.ac.uk