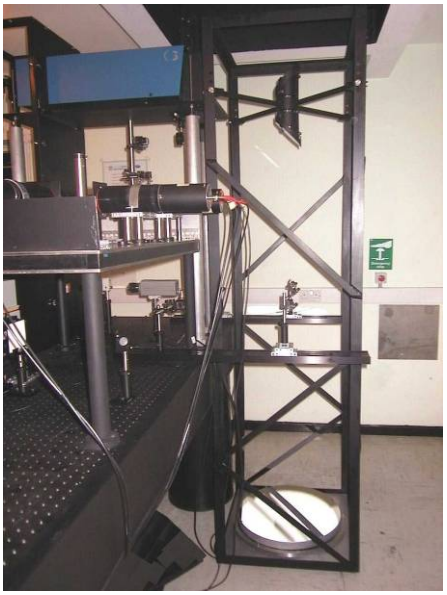
UV Raman lidar



The Chilbolton UV Raman lidar makes measurements of both elastically and inelastically (Raman) scattered radiation. The elastic scattering signals provide information on clouds and aerosols. Measurements of Raman scattering from water vapour and nitrogen provide water vapour mixing ratio profiles. The system also has the capability to produce temperature profiles in future, again using Raman scattering. The laser has a sufficiently high power that measurements are possible to altitudes of up to 3 km during daytime (when solar radiation is also detected by the system). The system is operated on a case-study basis.

The specification of the Raman lidar is as follows:

Parameter	**Value and comments**
Transmitter	
Laser type	Continuum 9050 Nd:YAG
Transmitted wavelength	354.7 nm
Pulse repetition frequency	50 Hz
Pulse energy	0.25 J typical
Pulse duration	7 ns
Transmitted beam diameter	0.1 m
Transmitted beam divergence	0.1 mrad
Transmitted beam geometry	Coaxial with receiver, vertically pointing

Receiver	
Main mirror diameter	0.46 m
Telescope geometry	Newtonian
Detected wavelengths	354.7 nm (elastic scattering) 386.7 nm (nitrogen Raman scattering) 407.8 nm (water vapour Raman scattering) 353.0 nm (rotational Raman scattering for temperature) 353.9 nm (rotational Raman scattering for temperature)
Field of view	0.4 mrad minimum
Maximum height resolution	7.5 m
Data acquisition type	12 bit analog, 25 MHz photon counting
Time resolution	20 s typical (can be lower)
Backscattering sensitivity	Typically ~ 10^{-5} $m^{-1}sr^{-1}$ at 12 km

A detailed description of the lidar system along with examples of measured data, is given in 'A Raman backscattering lidar system for tropospheric radio refractivity determination' by J. L. Agnew and K. J. Twort, Proceedings 21st ILRC Conference, Canada, July 2002.

Vaisala CT75K IR Ceilometer

The Vaisala CT75K is a commercially produced lidar system that makes elastic scattering measurements of clouds and aerosols. It is a low power system operating at 905 nm and comprises four transmitter/receiver units that operate simultaneously. Due to its relatively low power and long wavelength it does not detect molecular scattering. It is a low maintenance system capable of virtually unattended operation and is operated continuously at Chilbolton. It is normally operated close to vertically pointing, typically around 4° off zenith, to reduce specular reflections from ice clouds.

The specification of the IR Ceilometer is as follows:

Parameter	**Value and comments**
Transmitter (each unit of four)	
Laser type	InGaAs diode laser
Transmitted wavelength	905 ± 5 nm
Pulse repetition frequency	5.13 kHz
Pulse energy	1.6 μJ typical
Pulse duration	100 ns typical
Transmitted beam divergence	0.75 mrad
Transmitted beam geometry	Coaxial with receiver, manual steering

Receiver (each unit of four)	
Lens diameter	0.145 m
Detected wavelength	908 nm typical centre wavelength (elastic scattering)
Field of view	0.66 mrad
Height resolution	30 m
Time resolution	30 s
Backscattering sensitivity	~ 10^{-7} $m^{-1}sr^{-1}$ at low altitude

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