



### HALO Doppler lidar

The Chilbolton HALO Doppler lidar makes measurements of a) elastic backscattering, to detect clouds and other particulates, b) velocity along the measurement path where clouds or particulates are present and c) depolarisation ratio, a measure of the degree of symmetry of the scattering particles. It operates continuously and alternates between measurements at zenith (for measuring vertical velocity) and 4° off zenith (for removing large elastic scattering signals due to specular reflections from horizontally aligned ice crystals). The lidar uses fibre optics for transmission of the beam and detection of the signals.



The specification of the HALO Doppler lidar is as follows:

Parameter	Value and comments
<b>Transmitter</b>	
Transmitted wavelength	1.55 $\mu\text{m}$
Pulse repetition frequency	15 kHz
Pulse energy	10 $\mu\text{J}$ typical
Pulse duration	200 ns

<b>Receiver</b>	
Main lens diameter	0.06 m
Measurements	Co-polar elastic scattering Cross-polar elastic scattering (for depolarisation ratio) Doppler velocity along line of sight
Maximum height resolution	36 m
Data acquisition type	Heterodyne
Time resolution	30 s
Backscattering sensitivity	Typically $\sim 5 \times 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$ at 10 km

## Leosphere ALS450 depolarisation lidar

The Leosphere ALS450 is a depolarisation lidar. It makes measurements of the elastically backscattered signal at both the transmitted beam polarisation and at the orthogonal polarisation. This produces a measure of the depolarisation ratio of the scattering particles, which is zero for spherical particles and has a value between 0 and 1 for asymmetric particles. It is normally pointed at 4° from zenith in order to avoid potential large signals from specularly reflecting ice crystals which can occur when pointing at zenith. It can be manually fixed at any elevation angle.



The specification of the depolarisation lidar is as follows:

Parameter	Value and comments
<b>Transmitter</b>	
Laser type	Nd:YAG
Transmitted wavelength	354.7 nm
Pulse repetition frequency	20 Hz
Pulse energy	16 mJ typical
Pulse duration	6 ns
Transmitted beam diameter	0.025 m
Transmitted beam geometry	Biaxial with receiver, manual steering

<b>Receiver</b>	
Lens diameter	0.15 m
Measurements	Co-polar elastic scattering Cross-polar elastic scattering
Height resolution	15 m
Data acquisition type	Analog and photon counting with 1.5m raw height resolution
Time resolution	30 s
Backscattering sensitivity	Typically $\sim 10^{-6} \text{ m}^{-1} \text{ sr}^{-1}$ at 10 km by night

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