Data format of Japanese (MRI) lidar of Lauder   Ver. 1   Tetsu Sakai 2009/3/5

1. Data directory and file name

1.1 /LaYYMMDD/hh/hhmmss.xx (measurement data)

YYMMDD: year, month, and day

hhmmss: time when the measurement started (local time of PC)

xx: number of detection channel (00–07) or header file (hdr)

1.2 /LaYYMMDD/noise/hhmmss.xx (electrical noise data)

The data of files in this directory are taken with closing the receiver's aperture for taking the electrical noise. The electrical noise data is necessary for analyzing the analog measurement data but not for the photon counting data.

2. Data file

2.1 Header file (hhmmss.hdr)

- Observation site information
- Start and end time of data acquisition (local time of PC)
- Number of data bins and the bin width
- Number of laser shot
- Description of data channels (1–4, See Table 1 for the detail): wavelength, transmission of ND filter (nominal value), Range of voltage for detection, discriminator level, polarization angle (0: parallel, 1: perpendicular, 65446: total), and receiver's field of view
- Voltage of PMT, APD, and gating module, gate time, and comment

2.2 Raw data file (hhmmss.xx)

- Backscattering intensity (4 bytes of singed long integer, big endian) of each bin (bin number is given in the header file, e.g., 16000). Unit of the intensity is voltage: voltage = intensity/4096/(number of laser shot) × (range of voltage for detection) for the analog channels (file hhmmdd.00, 02, 04, and 06), and photon counts for photon counting channels (file hhmmdd.01, 03, 05, and 07)

Table 1:   Data channel and file header number of MRI lidar

Detection channel	1		2		3		4	
Measured component	532 nm-parallel, high		532 nm-parallel, low		532 nm-perpendicular		1064 nm	
Data acquisition	Analog	Photon count	Analog	Photon count	Analog	Photon count	Analog	Photon count
File extension number	00	01	02	03	04	05	06	07

3. Gain ratio of parallel to perpendicular channel at 532 nm

The gain ratios (g) of the parallel to perpendicular channel at 532 nm for the photon count are currently 0.90 for the parallel-high/perpendicular channels and 0.021 for parallel-low/perpendicular channels. These values were obtained by averaging the experimental values that were obtained using the polarization filter or illuminating incandescent light on 19 February 2009. We calculate the total linear depolarization ratio (δ) approximately by $\delta = gP_\perp/(gP_\perp + P_\parallel)$, where P_x is the noise subtracted photon counts of parallel ($\parallel$) and perpendicular ($\perp$) channels.

Example of Header file (La171142.hdr)

```
observational site        : Lauder
longitude (degree)        : 169.68
latitude (degree)         : -45.04
height msl (m)            : 370.00
start time                : 2009/02/20 17:11:42
end time                  : 2009/02/20 17:11:46
[Licel Transient Recorder]
number of bins            : 16000
bin width (s)             : 5.0E-8
integration time          : 31
ch.1 wavelength (nm)      : 532
ch.1 ND filter (%T)       : 100.00
ch.1 range (mV)           : 500
ch.1 discr. level         : 5
ch.1 PL angle (degree)    : 0
ch.1 field of view (mrad) : 1.00
ch.2 wavelength (nm)      : 532
ch.2 ND filter (%T)       : 13.00
ch.2 range (mV)           : 500
ch.2 discr. level         : 5
ch.2 PL angle (degree)    : 0
ch.2 field of view (mrad) : 1.00
ch.3 wavelength (nm)      : 532
ch.3 ND filter (%T)       : 100.00
ch.3 range (mV)           : 500
ch.3 discr. level         : 5
ch.3 PL angle (degree)    : 90
ch.3 field of view (mrad) : 1.00
ch.4 wavelength (nm)      : 1064
ch.4 ND filter (%T)       : 100.00
ch.4 range (mV)           : 500
ch.4 discr. level         : 20
ch.4 PL angle (degree)    : 65446
ch.4 field of view (mrad) : 1.00
High voltage 1 (V)        : 1800
High voltage 2 (V)        : 330
High voltage 3 (V)        : 0
Gate time (us)            : 1.000000E+1
comment                   :
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