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Development Of Mobile Validation Lidar Facility at NASA/LaRC

Grady Koch, Farzin Amzajerdian, Michael Kavaya, Upendra Singh,
Mulugeta Petros, and Bruce Barnes

Validation Lidar Facility

Validation Lidar (VALIDAR) Facility:

- Well-instrumented 48 ft long Trailer
  - Hemispherical Scanner with 20 cm effective aperture
  - Elaborate Video System consisting of 2 sets of cameras, monitors, and recorders
  - Weather Station
  - GPS Receiver
- Powerful state-of-the-art Coherent Doppler Lidar
  - 50-150 mJ, 5-10 Hz, Diode-pumped Transmitters
  - 10 cm COTS and 25 cm SPARCLE Telescopes
- Real-time data processor and display

Objectives

- Wind profiling to higher altitudes than typically achieved with coherent lidar.
- Demonstrate integrated lidar system based on Ho:Tm:YLF lasers.
- Test advanced receiver and processing components.
- Serve as ground-based validation source for future airborne and spaceborne lidar measurements
- Allow easy transport to field sites.

Validation Lidar Facility

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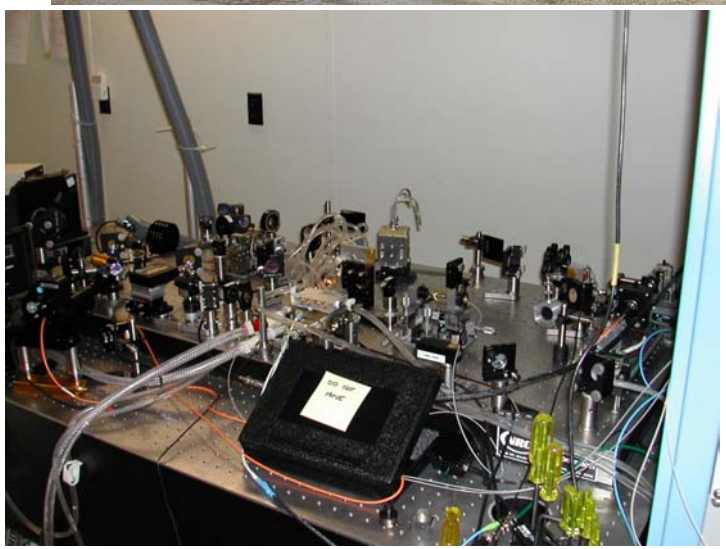
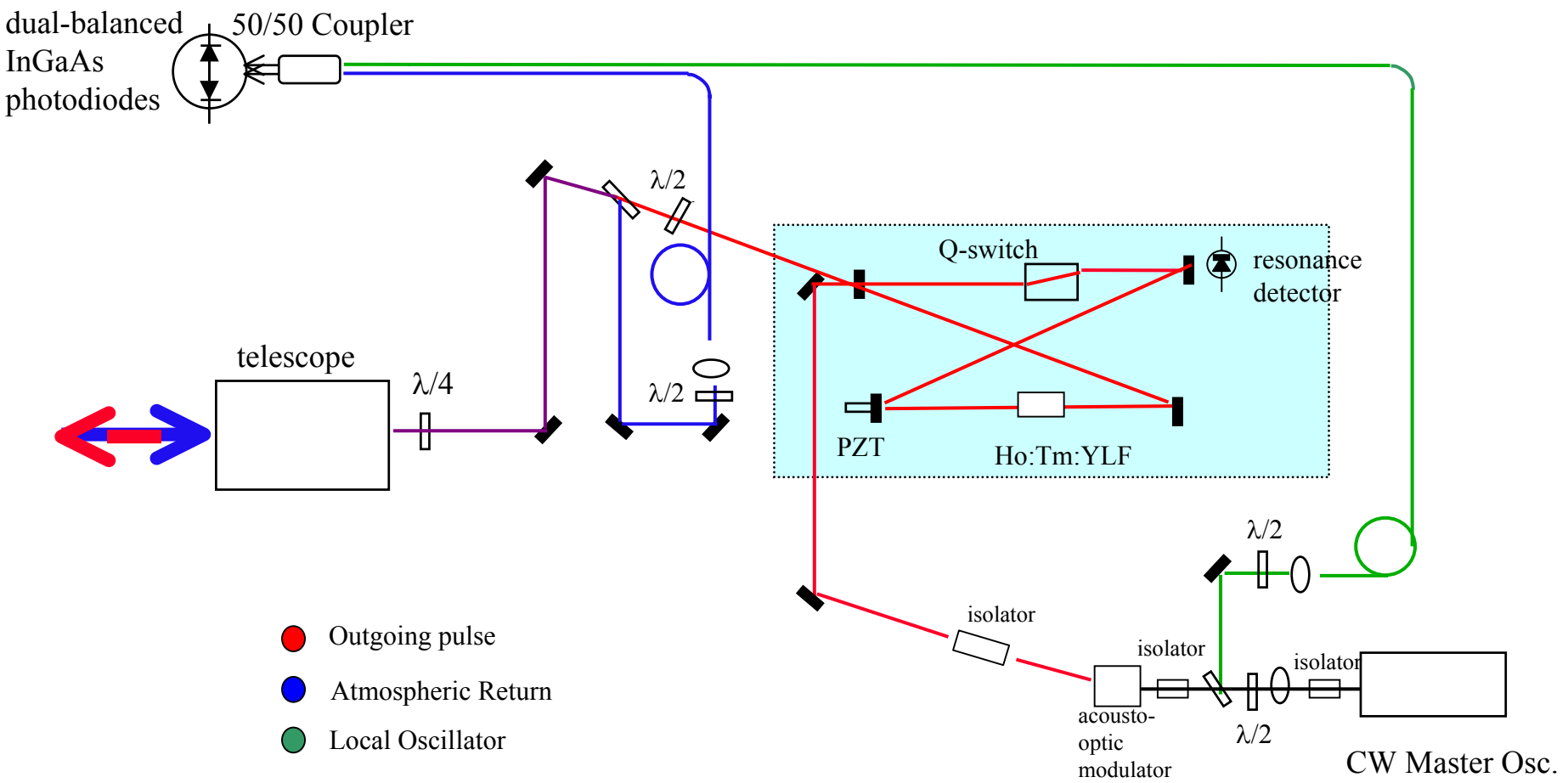
VALIDAR Trailer

Lidar System



Data Analysis & Visitors Rooms

Lidar System



Lidar Specifications

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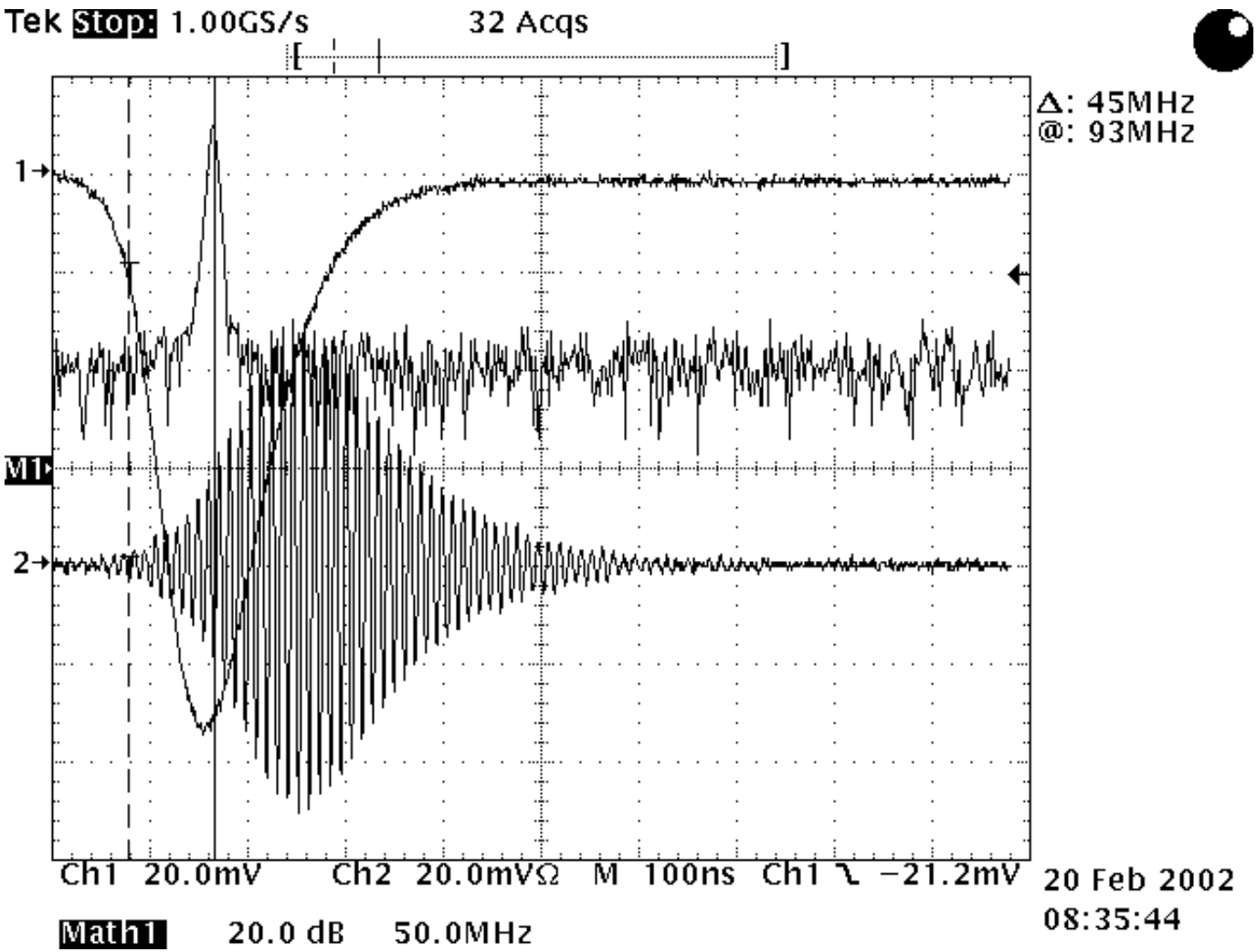
- Pulse energy = 45 mJ (greater than 75 mJ with new pumps)
- Wavelength = 2050.8 nm
- Pulse width = 180 ns
- Pulse repetition rate = 5 Hz
- Spectrum = single frequency
- Beam quality < 1.3 x diffraction limit
- Digitization rate up to 2 Gs/s at 8 bits
- Beam scanning: hemispherical coverage

Laser Pulse Diagnostics



Data Acquisition and Processing

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- Digitized up to rate of 2 Gs/s with 8 bit resolution
- Real-time computation of wind velocity by Hammerhead processors.
- Digitizer and processor housed and controlled in Compact PCI platform.
- Off-line processing by LabVIEW developed, using oscilloscope as a digitizer (see data below).

Electronics and Real-Time Processing

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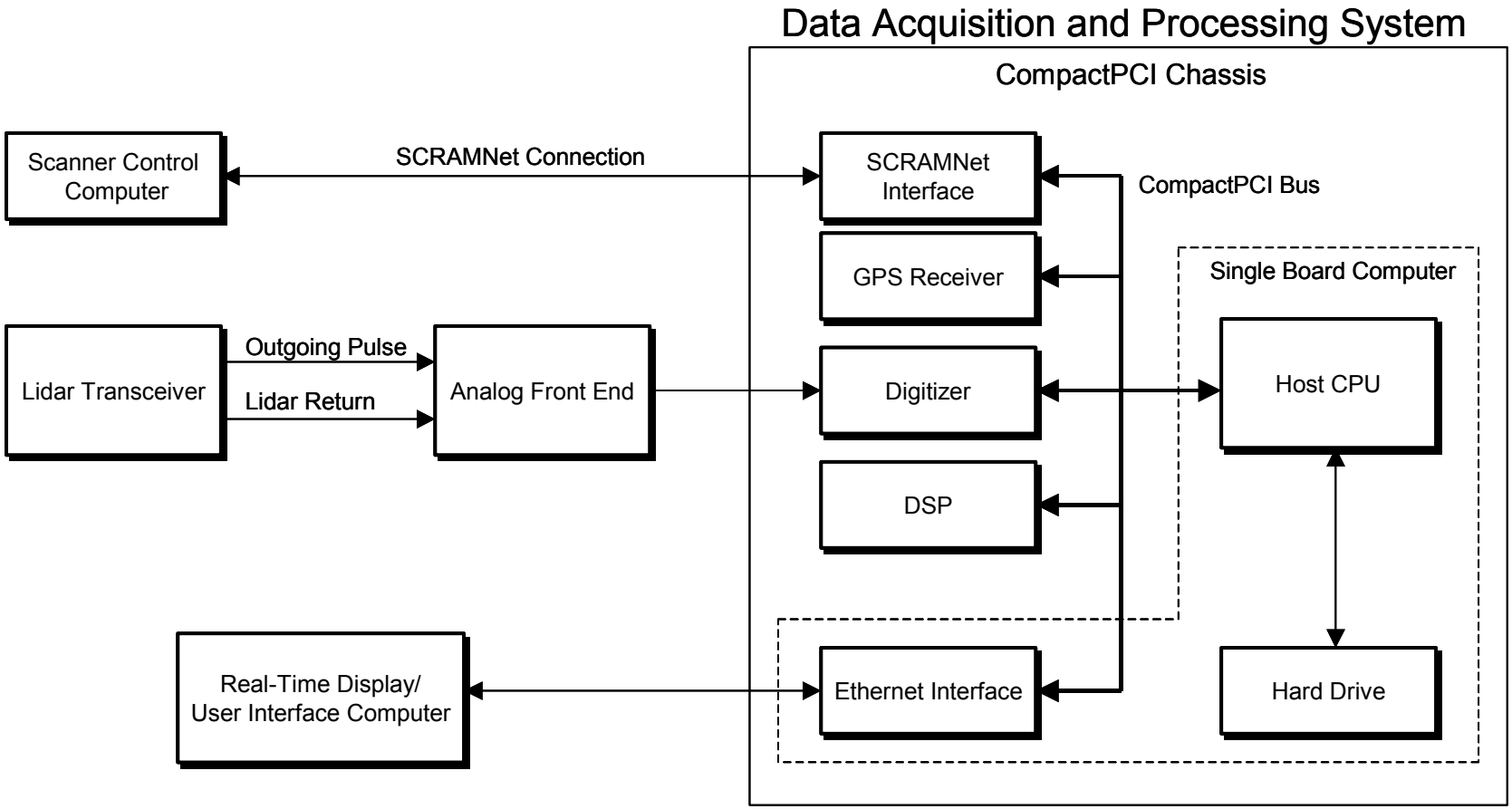

Sample Wind Profile

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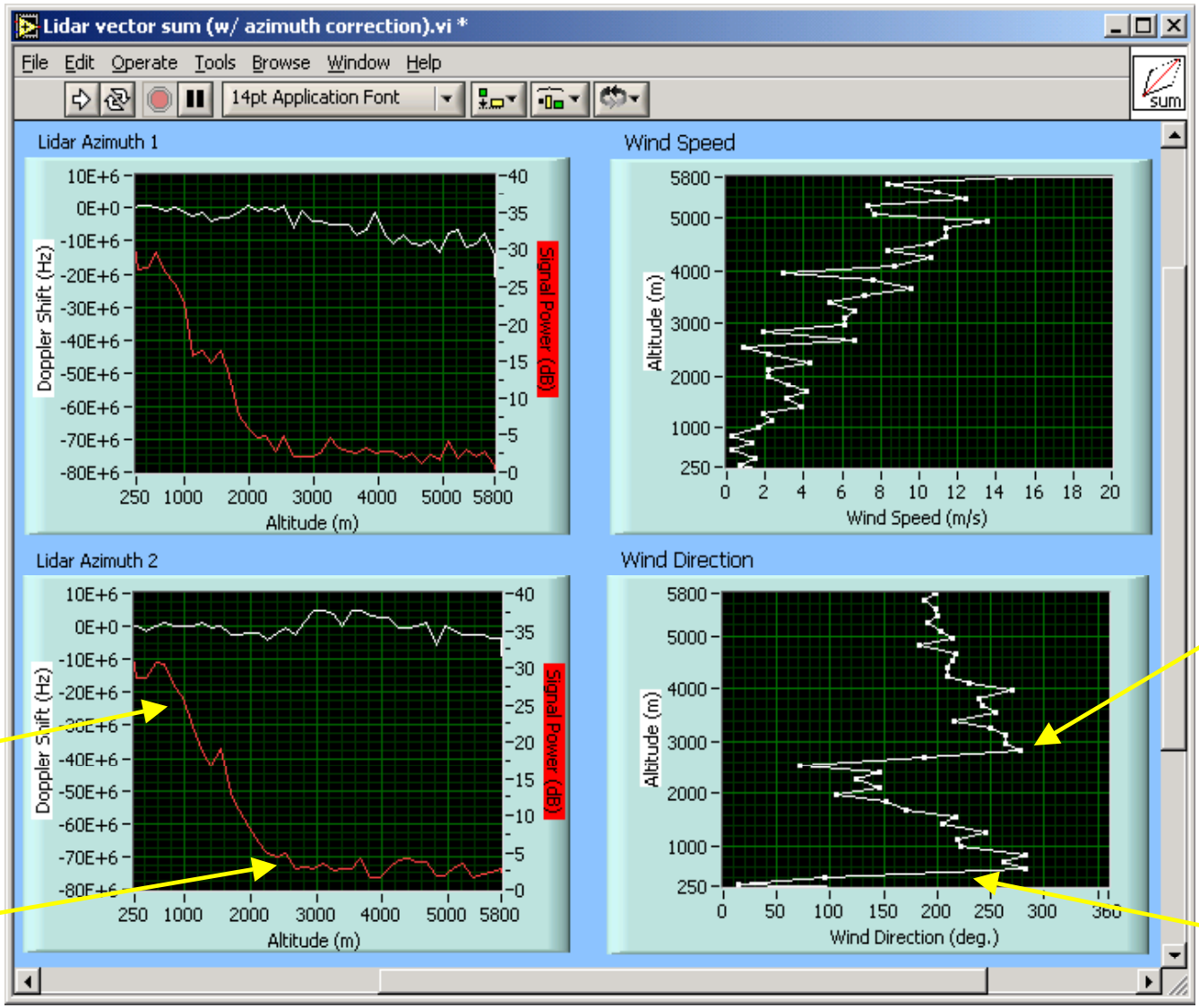
- 10 shots/LOS
- 2 LOS/data
- 450mJ/LOS
- 900mJ/data



Strong return boundary layer

Weaker return in free troposhere

Direction change in transition from boundary layer to free troposhere

Ekman spiral

Acknowledgements

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