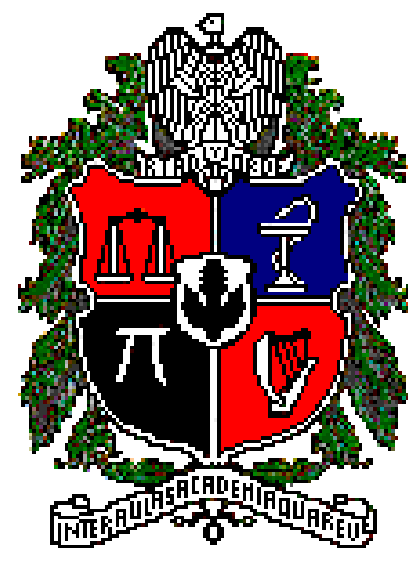


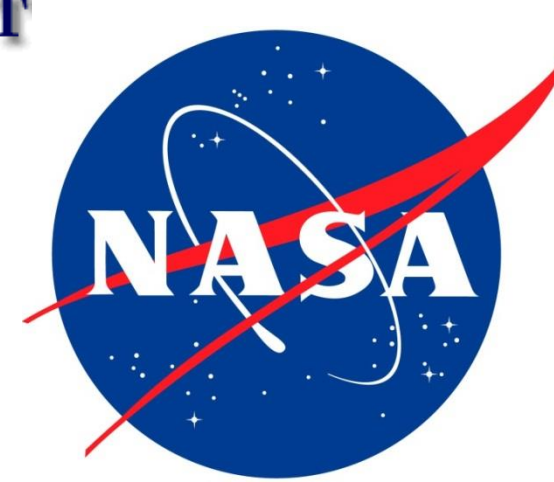
Development Atmospheric Spectro-radiometry as a Support Technique to the LOA-UNAL Activities

Mauricio Múnera¹, Luis F. López¹, Daniel Nisperuza¹, Andrés E. Bedoya¹, Dairo Alegría¹, Carmen E. Zapata², José F. Jiménez², Alvaro Bastidas¹



¹Laser and Spectroscopy Group
²Air Quality Laboratory
Universidad Nacional de Colombia Sede Medellín

1mmunerap@unal.edu.co



Abstract: Remote sensing systems have the ability to obtain information from a far object. This concept may be applied to atmospheric study related to air quality, aerosols transport, and the climate. In the LOA-UNAL has development a singular automatic Spectroradiometer (EPR-LOA) system, which has been incorporated to the LOA-UNAL activities. In this paper, we shown the first results of solar spectrum registered over Medellín city (6.26°N, 75.58W, 1471 a.g.s.l) covering range from 250 nm to 700 nm, and the first attempt for obtain the AOD for the two lidar wavelengths: 355 nm and 532.

LOA - UNAL

Director:

- PhD. Alvaro E. Bastidas G.

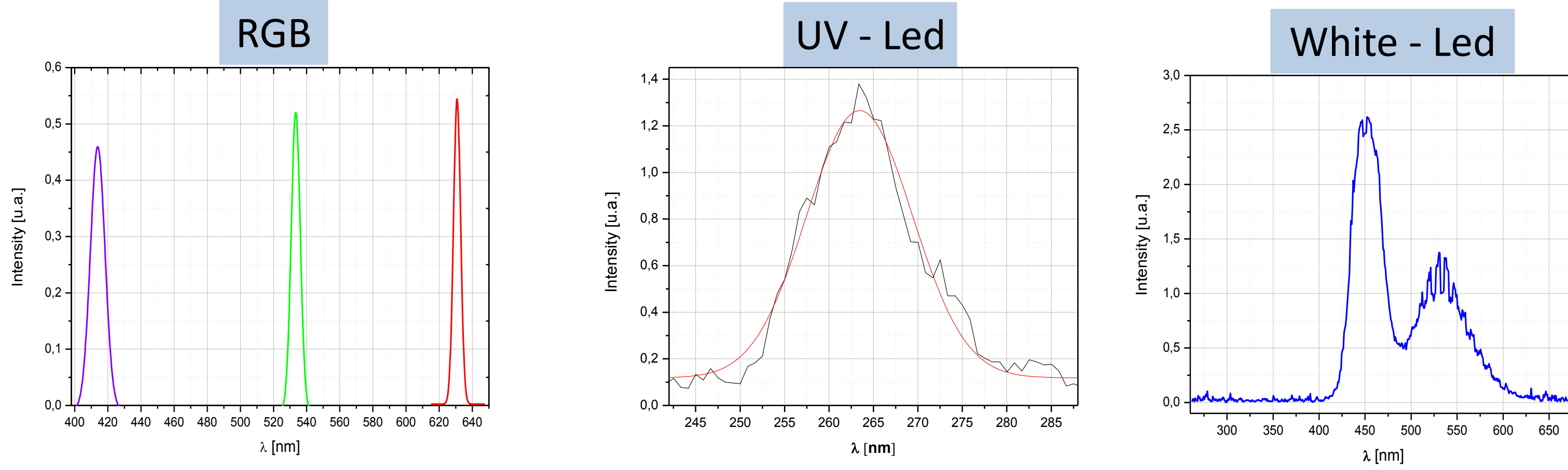
Students:

- PhD. Student Daniel J. Nisperuza Toledo
- PhD. Student Miguel A. Garrido
- PhD. Student Juan E. Velez
- Master Student Andres E. Bedoya V.
- Master Student Dairo L. Alegría C.
- Master Student Mauricio Múnera P.
- Engineer Luis F. Lopez M.
- Undergraduate Student David Sepúlveda

Research fields:

- Atmosphere remote sensing
- Laser applications
- Spectroscopy

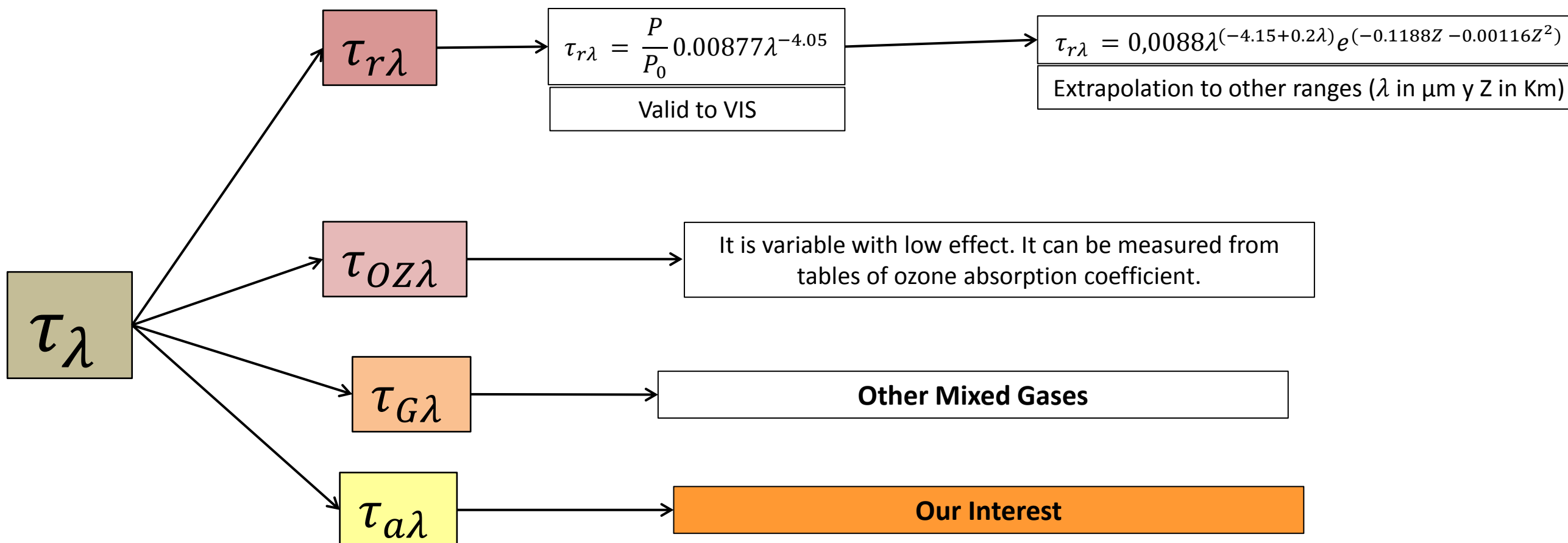
Wavelength Calibration



Methodology to obtain AOD

$$V_{\lambda} = \frac{V_{0\lambda}}{R^2} \exp(-\tau_{\lambda} m) \quad \text{- Beer-Lambert-Bouguer Law}$$

$$m = \frac{1}{(\cos\theta_z + 0.50572(1.46468 - \theta_z)^{-1.6})}$$



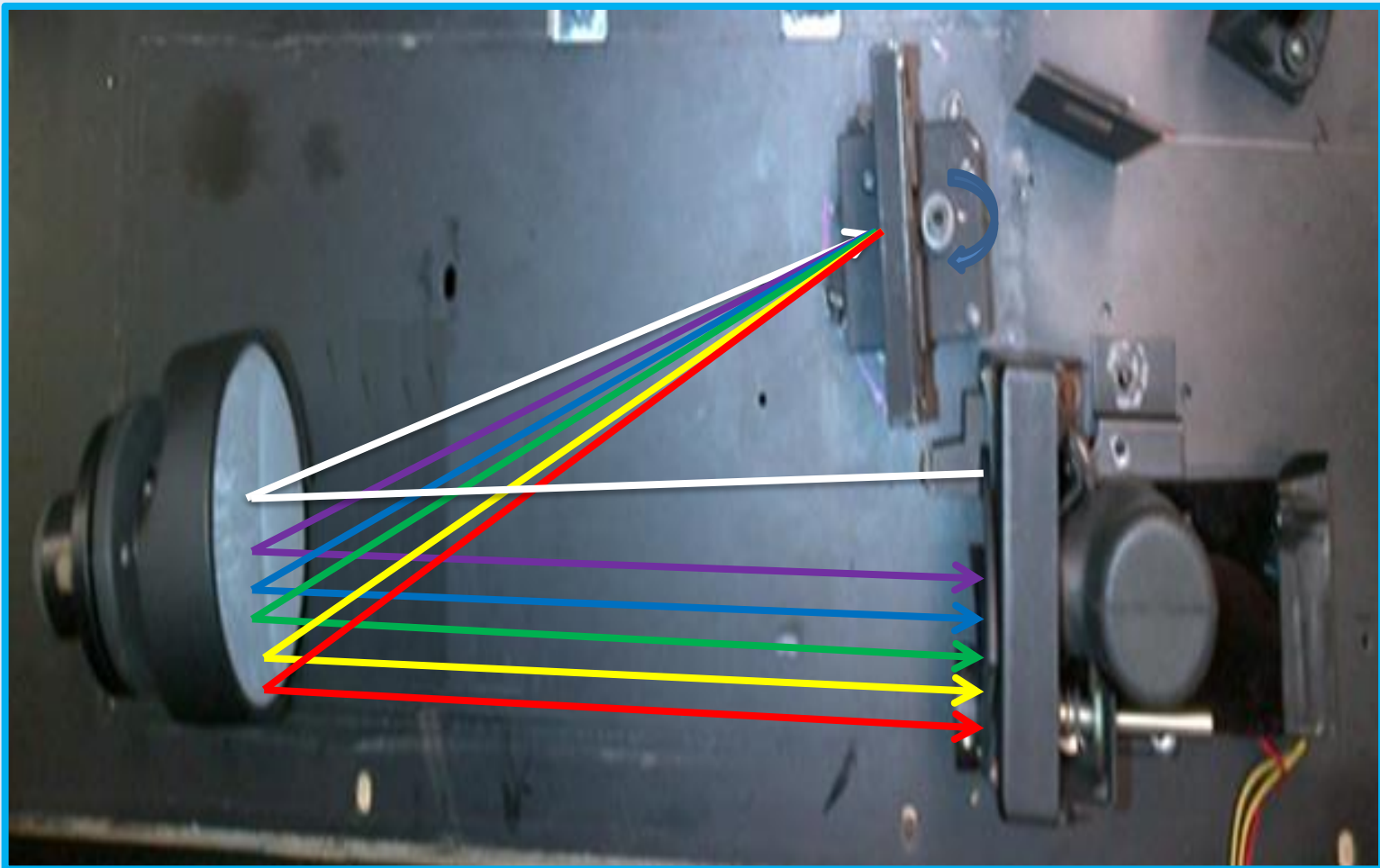
$$\tau_{a\lambda} = \tau_{\lambda} - \tau_{OZ\lambda} - \tau_{r\lambda} - \tau_{G\lambda}$$

Spectro-radiometer Set-Up

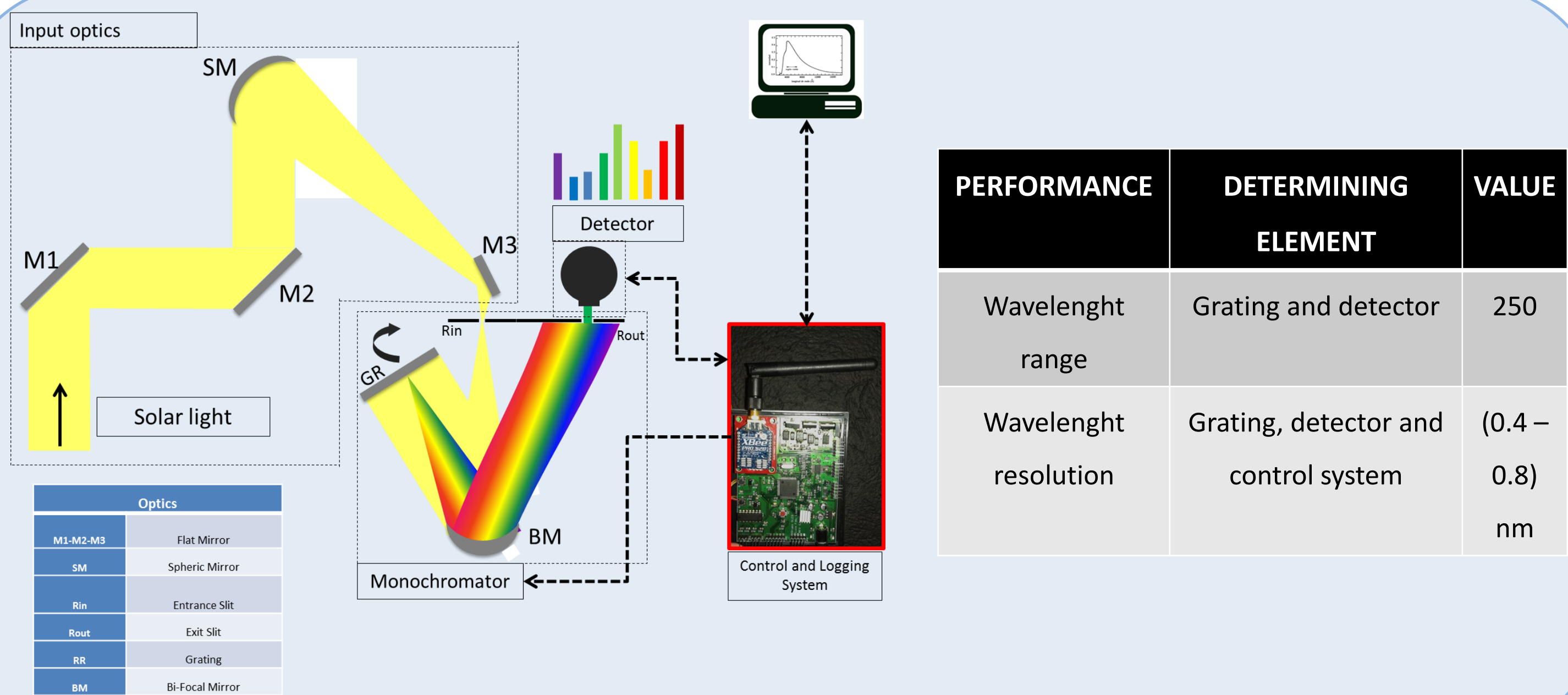
The instrument



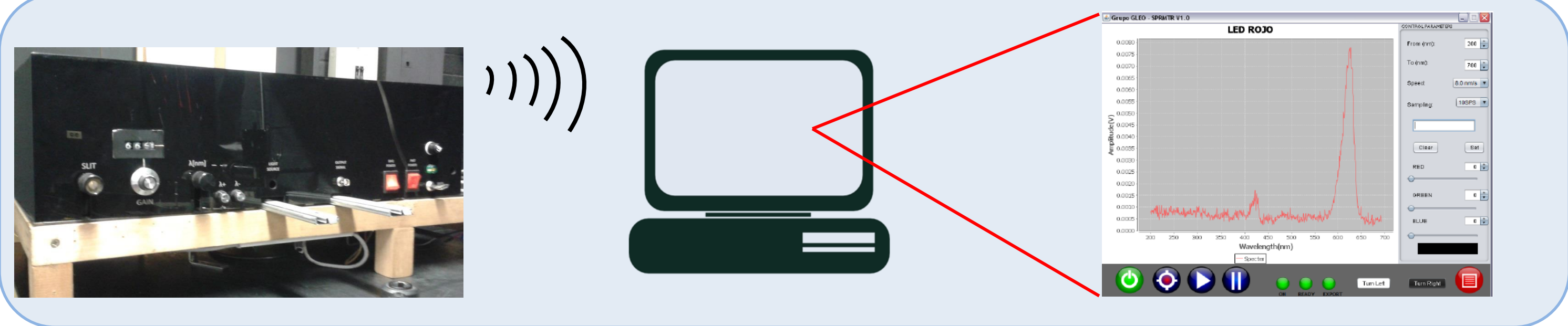
Used for fast irradiance scanning over 250 - 700 nm wavelength region. The goal is measuring of solar spectral irradiance.



Design and characteristics

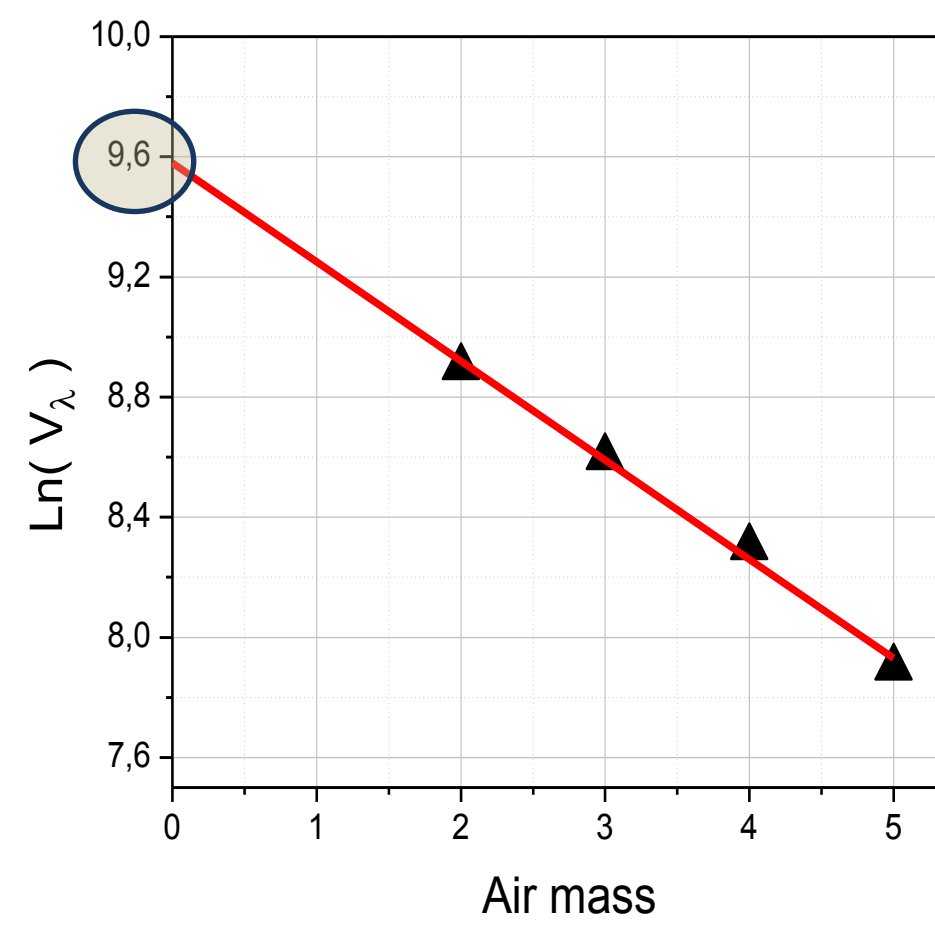
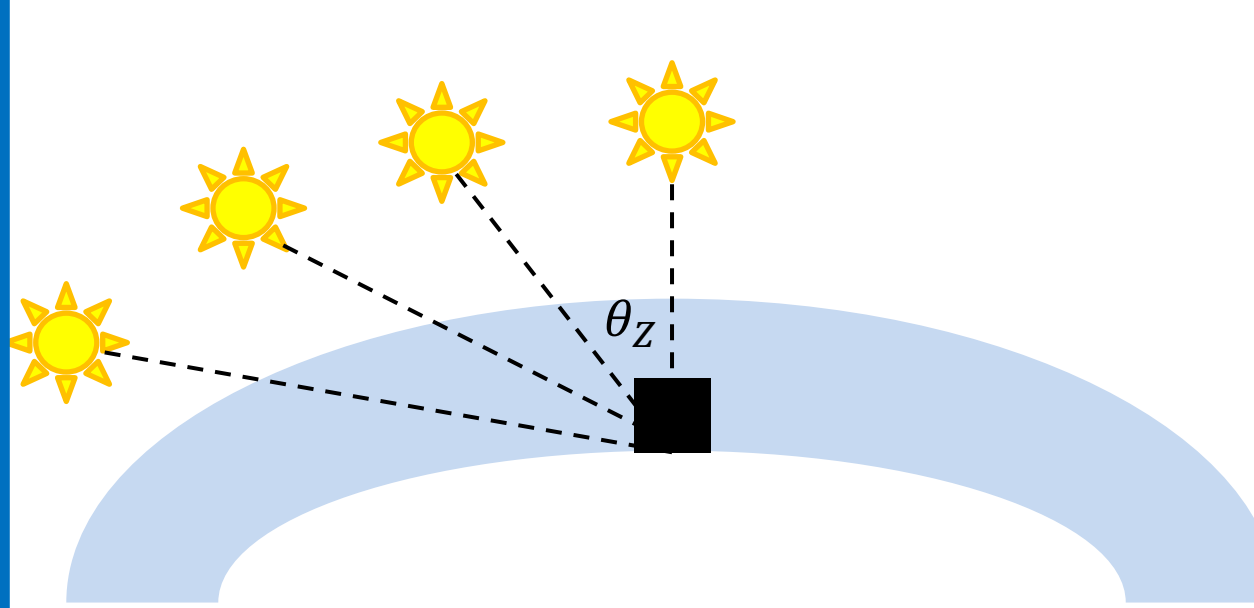


Electronic control and the interfaz



Langley Method: V_0

$$V_{\lambda} = \frac{V_{0\lambda}}{R^2} \exp(-\tau_{\lambda} m) \quad \longrightarrow \quad \ln(V_{\lambda}) = \ln\left(\frac{V_{0\lambda}}{R^2}\right) - \tau_{\lambda} m$$



- Extrapolation to $m=0$
- Low atmospheric variability
- Recommended in clear sky
- Low concentration of aerosols (high places)

Conclusions

- LOA-UNAL has developed and built an Spectro-radiometer system fully operationally to atmospheric studies as a support technique to LOA-UNAL activities.
- Spectro-radiometer system was wavelength calibrated by using several light sources.
- The spectro-radiometer, potentially will provide data for algorithm validation of aerosol retrievals and it helps to studying optical aerosol properties.

References

- A GUIDE TO SPECTRORADIOMETRY, Instrument & Applications for the Ultraviolet, BENTHAM, 2014
- M. MÚNERA, Implementación de un Sistema de Espectroradiometría Solar, Universidad Nacional de Colombia Sede Medellín, 2013.
- E.M. ROLLIN, An introduction to the use of Sun-photometry for the atmospheric correction of airborne sensor data, Department of Geography University of Southampton, Southampton.
- L. F. LÓPEZ, Diseño de un sistema de generación y registro de luz multiespectral, Universidad Nacional de Colombia Sede Medellín, 2013