

A night sky filled with stars, with a telescope dome visible on the left side. The dome is illuminated from within, and there are some lights on the structure. The sky is dark, and the stars are bright and numerous. The telescope dome is white with a dark band around the top. There are some lights on the structure, and the sky is filled with stars. The overall scene is a night sky with a telescope dome and stars.

INSTALLATION OF A SEEING MONITOR WITH ROBOTIC TELESCOPE AT THE SAN PEDRO MARTIR OBSERVATORY.

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SEEING

The seeing is the term used in astronomy to quantify the steadiness or the turbulence of the atmosphere.

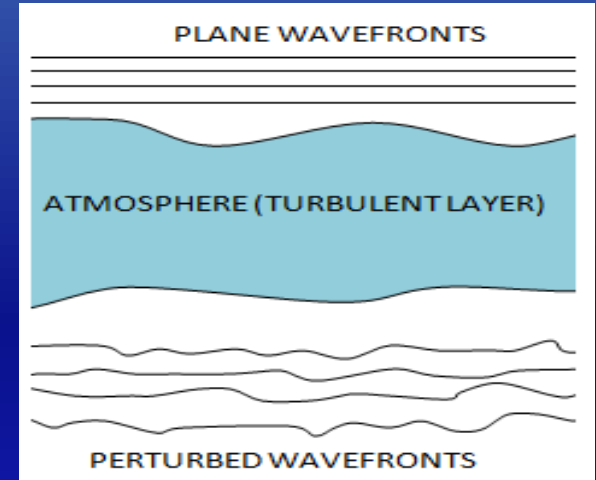
In astronomy, seeing is usually defined as the full width half maximum (FWHM) of a long exposure stellar image taken at the focus of a large telescope.

$$FWHM = 0.976 \frac{\lambda}{r_o}$$

The variance of image position, σ , produced by atmospheric turbulence in a telescope with aperture diameter D has the following dependence on Fried's parameter

$$\sigma^2 = K \lambda^2 r_o^{-5/3} D^{-1/3}$$

where K is a constant.



SEEING IN SPM OBSERVATORY

Seeing has been measured in Mexico's Observatorio Astronómico Nacional at San Pedro Mártir (SPM) since 1968 by using several methods.

- *Polaris star trial (E. Mendoza, 1968; Merle F. Walker 1971)
- *Carnegie Seeing Monitor (J. Echeverria et al , 1998)
- ***Generalized Seeing Monitor** (Conan 2002)
- ***Differential Image Motion Monitor** (Conan 2002, R. Michel et al 2003, J. Núñez et al 2007, J. Bohigas et al 2008).
- ***MASS-DIMM**(Multi Aperture Scintillation Sensor- Differential Image Motion Monitor). (Thirty Meter Telescope Project 2004-2008).

2007 campaign

RoboDIMM (National Optical Astronomy Observatory property) and SPM-DIMM (Observatory Astronomical National property), producing simultaneous seeing measurements during campaign of intercalibration in SPM observatory.

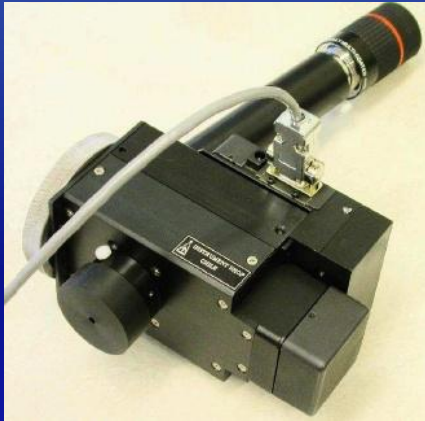
ROBODIMM
(NOAO)



SPM-DIMM
(SPM Observatory)

Side-by-side, producing simultaneous seeing measurements

NEW SEEING MONITOR FOR SPM OBSERVATORY



•A MASS-DIMM SYSTEM WAS ACQUIRED BY SPM OBSERVATORY.

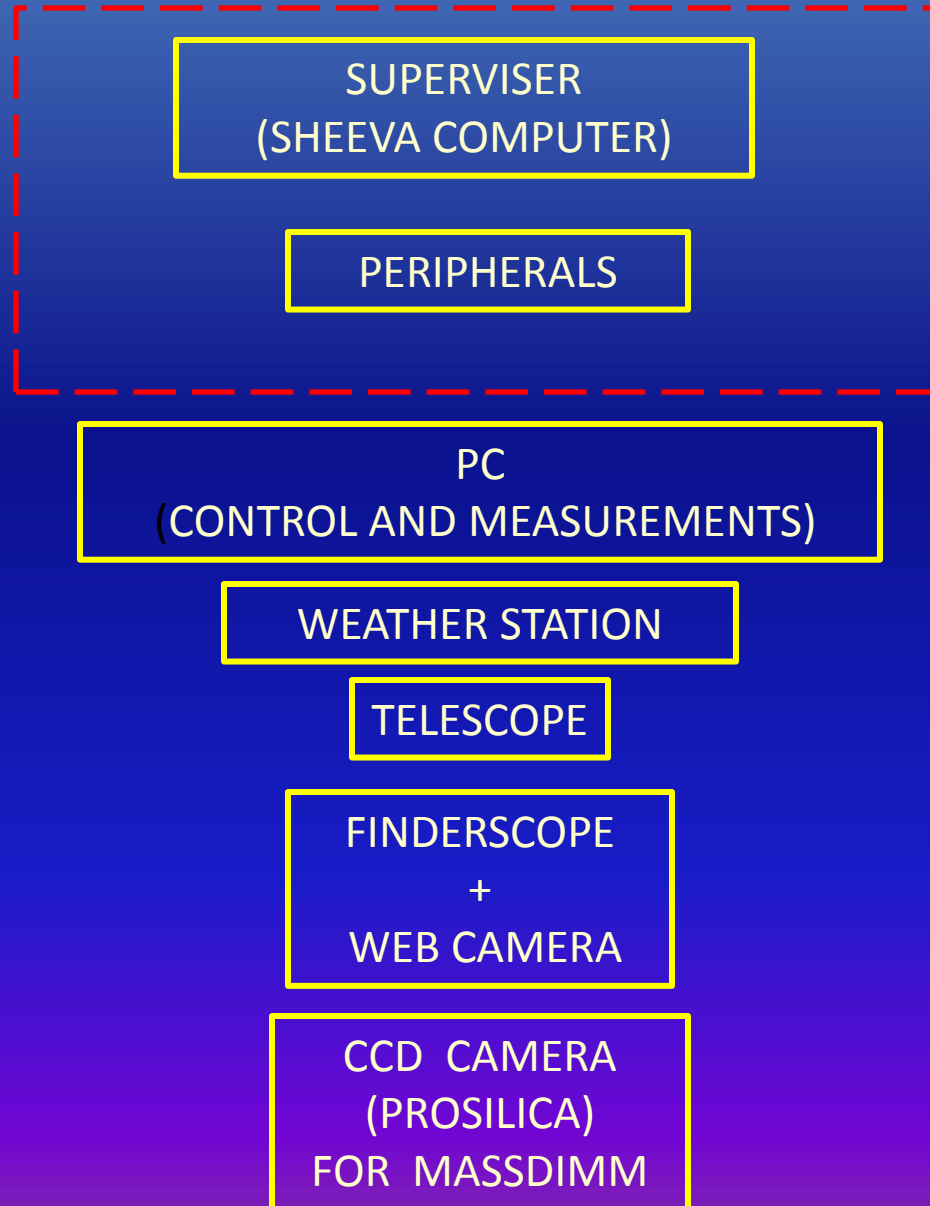


CCD camera
Prosilica GC650
90 fps,
Size pixel 7.4 μm
659x493 pixels



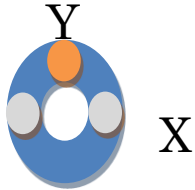
Telescope Meade (RCX-400)
12 inches,
Ritchey-Chretien Design
f/8

BLOCK DIAGRAM



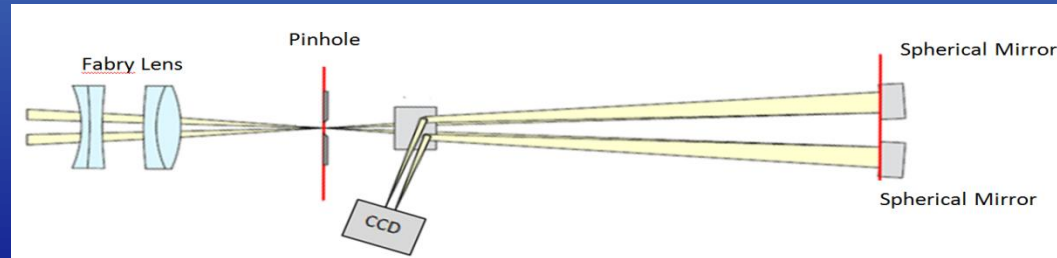
MASS-DIMM SYSTEM

Pupil Segmentation Unit (PSU) for MASS

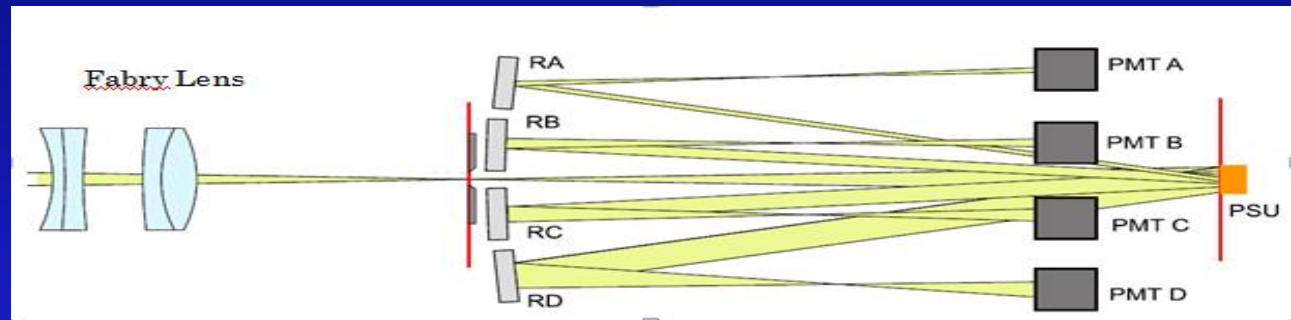


Spherical Mirror for DIMM

Geometry of exit pupil imaged by Fabry lens.



Optical layout of DIMM sub-device



Optical layout of MASS sub-device. RA, RB, RC, RD are re-imaging mirrors, PMT A-D are photomultipliers and PSU is the pupil segmentation unit.

SEEING MONITOR



MASS-DIMM device

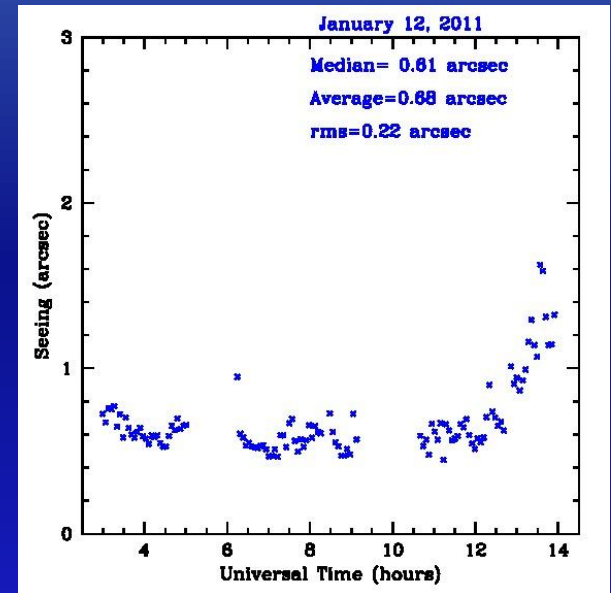
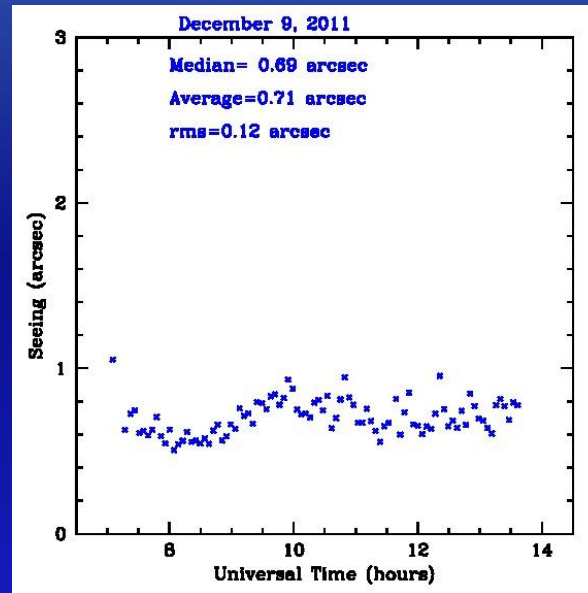


New electronics Control

Seeing measured with new seeing monitor at SPM observatory



MASS-DIMM unit sits on top of a 7m concrete tower.



THE SYSTEM IS NOW STOPPED BECAUSE WE ARE IMPROVING
TO AVOID PROBLEMS FOR SHOCK IN OUR ELECTRONIC SYSTEM.

THANKS!